CERAMIC ABSTRACTS and THE BULLETIN

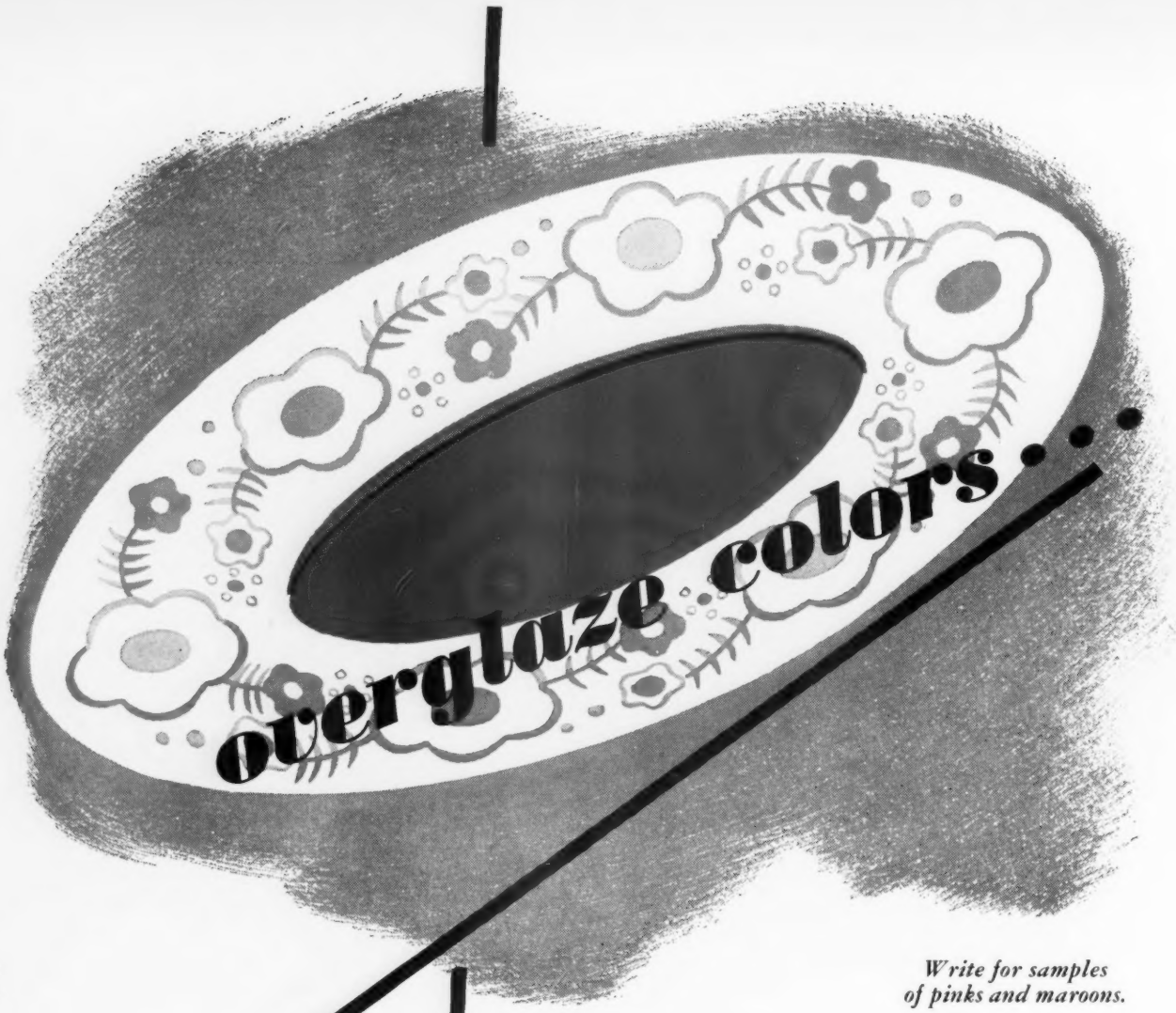
OF THE

AMERICAN CERAMIC SOCIETY

MARCH 15, 1945

MONTHLY PUBLICATION DEVOTED TO THE ARTS AND SCIENCES RELATED TO THE SILICATE INDUSTRIES

FORTY-SEVENTH ANNUAL PROGRAM



Write for samples of pinks and maroons.

Body, Slip and Glaze Stains
Underglaze Colors
Oxide Colors
Prepared Art Glazes
Squeegee Oils and Mediums
Gold, Silver, Platinum and Lustre Preparations
Metallic Oxides and Chemicals

Faster, more profitable production, with fewer rejects are the major reasons why the claywares industry has used Drakenfeld colors and coloring chemicals these many years. For all Drakenfeld colors are highly dependable in workability and maturing temperature—are formulated with rigid adherence to specifications, not only as to color match but in duplicating your production standards.

Let us help you work out the application of colors and coloring chemicals. The assistance of our highly-skilled and thoroughly experienced technologists is at your service. Send the details of your project to Drakenfeld today—for practical analysis and recommendation—without obligation.

YOUR PARTNER IN SOLVING COLOR PROBLEMS

Drakenfeld

B. F. DRAKENFELD & CO., INC., 45-47 Park Place, New York 7, N. Y.
Factory and Laboratories: Washington, Pa.

Pacific Coast Agents:
Braun Corp., Los Angeles 21 . . Braun-Knecht-Heimann Co., San Francisco 19

TABLE OF CONTENTS

Volume 24 March 15, 1945 Number 3

CERAMIC ABSTRACTS Section

Abrasives 49
Art and Archeology 50
Cements 51
Enamel 51
Glass 52
Structural Clay Products 55
Refractories 55
Whiteware 57
Equipment and Apparatus 58
Kilns, Furnaces, Fuels, and Combustion 60
Geology 61
Chemistry and Physics 63
General 65

THE BULLETIN Section

FORTY-SEVENTH ANNUAL PROGRAM

General Session on Postwar Problems 95
Design Division 96
Enamel Division 97
Glass Division 99
Materials and Equipment Division 101
Refractories Division 103
Structural Clay Products Division 105
Whitewares Division 106
Author Index to Program 104

CERAMIC HISTORY AND PAPERS

William A. Harty, President and General Manager, The Exolon Company 87
Proportional-Mixer Kiln—J. T. Robson 90
Fuel-Oil System—J. T. Robson 92

Activities Section **94, 107–118**

Advertisers' Index **6**

Buyers' Guide **38, 40, 42, 44, 45**

Publication Office: 20th & Northampton Sts., Easton, Pa.
Editorial, Executive, and Advertising Offices: 2525 N. High St., Columbus 2, Ohio.
Committee on Publications: R. L. STONE, *Chairman;* HARRY THIEMECKE, R. E. BIRCH, H. ZANE SCHOFIELD, R. C. PURDY, *ex-officio.*
Entered as second-class matter at the post office at Easton, Pa., under the act of March 3, 1879. Published monthly.
Subscription $1.50 a year. Single copies twenty-five cents.
(Foreign and Canadian postage, 50¢ additional on subscriptions)
(Copyright 1945, American Ceramic Society, Inc.)

Lancaster

With the "Lancaster"...

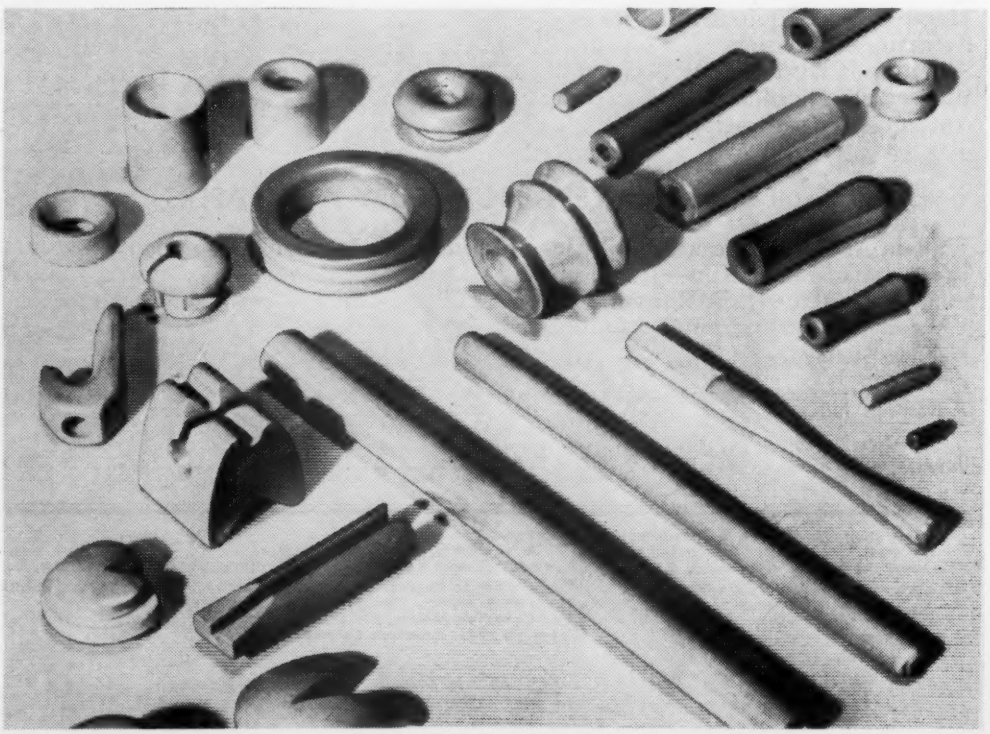
MIXING ACTION

SPEAKS

LOUDER THAN WORDS

Illustration shows how material is conveyed by clockwise rotation of mixing pan and deflected by stationary side wall plow into the path of counter-clockwise rotating plows and muller or mullers which are established off-center of pan diameter.

We could fill page after page with the praises of "Lancaster" Mixers by satisfied users . . . but we think the mixing action of the "Lancaster" speaks louder than words. The "Lancaster" is the only batch mixer to combine counter-current mixing with balanced mulling. The resulting control, precision and uniform quality of mixes makes the "Lancaster" the choice for more than 30 diversified mixing processes.



"Lancaster" Mixers blended the batches from which these high-quality ceramics were made. *"Lancasters" are the mixers which assure peak efficiency in dry mixing—the modern process that offers the ceramic industry great economies.*

Photo courtesy of American Lava Corporation, Chattanooga, Tenn.

MIXERS

THE SCIENTIFIC COUNTER-CURRENT RAPID BATCH MIXING SYSTEM

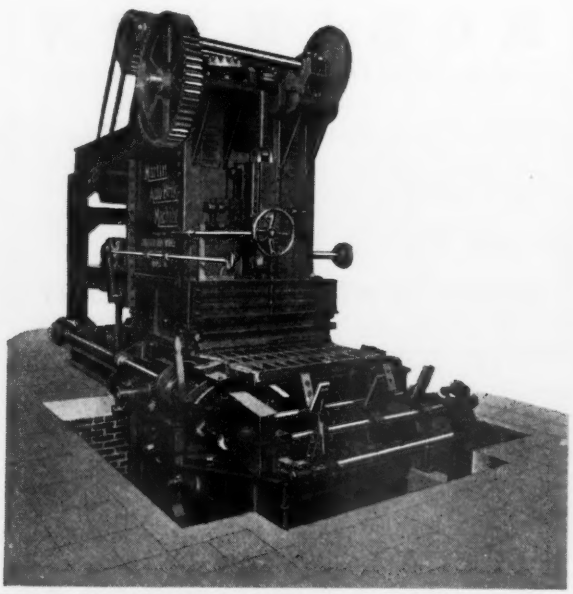
For Improved Man-Hour Productivity in High Quality Brick...
THE LANCASTER AUTOBRIK MACHINE
with the LANCASTER AUTOMATIC PALLET CAR LOADER

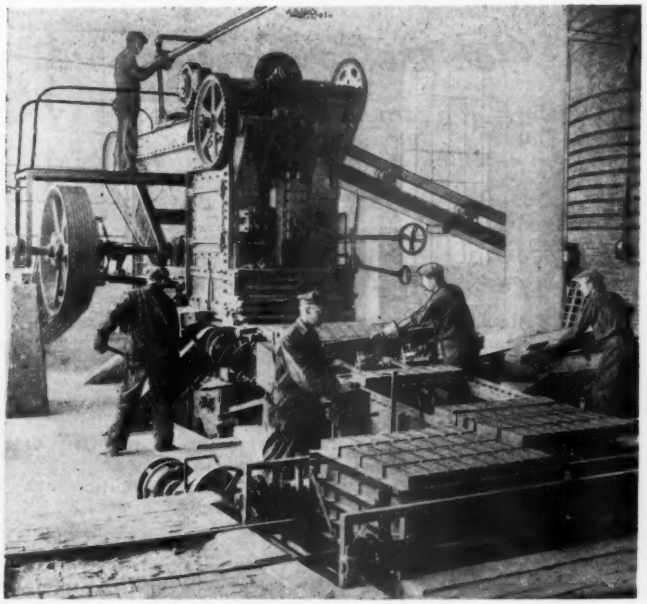
Man-hour productivity leaps upward when you team the Lancaster Autobrik Machine with the Lancaster Automatic Pallet Car Loader. For the Lancaster Autobrik Machine molds the brick . . . automatically places the brick on the pallet . . . automatically sands the brick molds and returns them to position under the die. In combination with the Lancaster Automatic Pallet Car Loader, it also automatically loads the pallets of brick onto Rack Dryer Cars.

And with this combination on the job, you'll not only turn out more brick per man-hour . . . you'll also turn out brick which have a high market value! There's just one way to make brick which retain all the beauty and soft tones of the original Soft Mud, Sand Molded "Colonials" . . . and yet avoid hand operations. The way to do it is to make your brick by the Sand-Molded Process on Lancaster Autobrik Machinery.

Sand-Molded Bricks, molded on Lancaster Autobrik Machines, are square and uniformally dense. They dry and burn faster with less cost. They take the mortar readily and hold a tight joint. Their sand faces keep the wall clean and improve with age.

"Lancaster" is qualified by the experience of three generations in Brick Plant Engineering to advise you about the installation of the Sand Molded Process in your plant. Write today.





(Left) Model 46 "Martin" Vertical Type Autobrik Machine. (Right) "Lancaster" Autobrik Machine and Automatic Pallet Car Loader. 50,000 to 100,000 bricks per day—molded; dumped onto pallets; loaded on dryer cars; and cars delivered to tunnels by only 6 men on the equipment.

The "Lancaster Autobrik Machine" is readily adaptable to the production of modular brick sizes.

LANCASTER IRON WORKS, INC.

BRICK MACHINERY DIVISION

LANCASTER, PENNA., U. S. A.

MONTGOMERY PORCELAIN PRODUCTS COMPANY

SPECIALIZING IN

Primary Protection Tubes for all makes of Pyrometers

MONTGOMERY

PYROMETER TUBES

★ MULLITE

★ REFRACTORY PORCELAIN

MONTGOMERY PORCELAIN PRODUCTS CO.

FRANKLIN OHIO

FOR CLAY FILTRATION

use

METAKLOTH

(green)

Silvakloth

(black)

The oldest and best cupra-ammonium finish for

POTTERY FILTER FABRICS.

This finish gives the fabric a smooth, lustrous, metallic surface—no fibres to catch and break the clay cake as it comes away in one perfect piece—filters better and faster than untreated cloths—requires fewer washings and is easier to keep clean—more continuous operation of your press—lower labor costs and a larger and better product with the same machinery.

The fabric is mildew proofed—has an increased tensile strength—has a longer useful life.

This means larger profits for you.

Consult your bag manufacturer or write to,

Metakloth Company, Lodi, N. J.

For Better Refractories

"G-1 REFRACTORY WHITE CLAY"

Infallible for High-Duty Clay Refractories

- Great Refractoriness (Cone 34),
- High Plasticity,
- Enormous Load-Carrying Capacity,
- Good Resistance to Slagging and Corrosion.

Absolutely uniform and pure (Appr. 98% clay substance). A money-saver because of longer life through greater strength.

IN CLAY CASTING a small percentage of "G-1" added to body mix gives faster casting rates; eliminates drying and burning cracks; stabilizes the properties of casting slip, drying cast ware with more ease; and leaves cast ware in perfect, leather-hard condition with no "drooping" after mold is removed.

THIRTY years in successful, practical use—millions of tons available—furnished crude, air-dried, oven-dried, crushed, or pulverized. Prompt shipments, Georgia clay tariff rates.

SAVANNAH KAOLIN COMPANY

Suite 314, American Building

Savannah, Georgia

Mines: Gordon, Ga., on main line of Cen. of Ga. Ry.

ROBINSON

Fans and Blowers for the Ceramic Industry

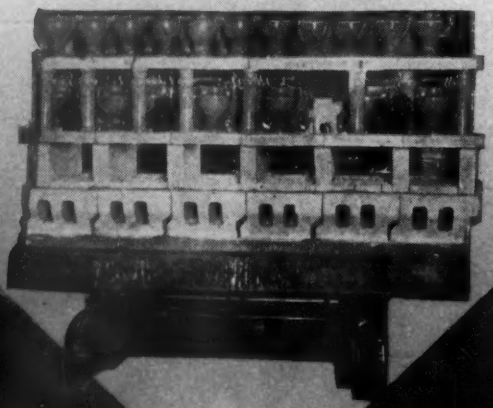
Turbine Type Pressure Blowers	Recirculating Fans
Forced Draft Fans	Waste-Heat Fans
Induced Draft Fans	Drier Systems
	Cooling Fans

Place your air handling problems in our hands . . .
Our 50 years' experience assures efficient results.

ROBINSON VENTILATING COMPANY

ZELIENOPLE PENNSYLVANIA

What Will Make Kiln Furniture Last Longer?



CRYSTOLON

CRYSTOLON (silicon carbide) Kiln Furniture by Norton has long been recognized as giving maximum service with minimum operating costs. This serviceability results from the great refractoriness, chemical stability, strength under load and high heat conductivity of CRYSTOLON Refractories. For best results use CRYSTOLON Kiln Furniture throughout the entire setting—not only for the upper decks of the car but also for the supports and the main deck.

NORTON COMPANY—Worcester 6, Mass.

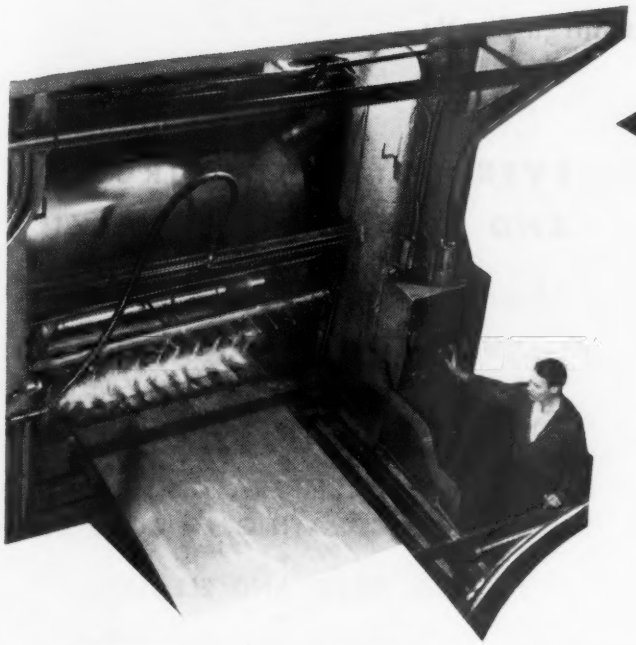
Norton Longer Lasting **Refractories**

ALPHABETICAL LIST OF ADVERTISERS

	Page
American Lava Corp.	19
American Potash & Chemical Corp.	29
American Rolling Mill Co.	7
American Telephone & Telegraph Co.	46
Babcock & Wilcox Co.	17
Burros Bag Co., Inc.	37
Buyers' Guide	38, 40, 42, 44–45
Ceramic Color & Chemical Mfg. Co.	45
Chicago Vitreous Enamel Product Co.	15
Classified Ads	29
Clearfield Machine Co.	32
Clinchfield Sand & Feldspar Corp.	36
Corhart Refractories Co., Inc.	24
Denison Engineering Co.	33
Dietert, Henry W., Co.	45
Drakenfeld, B. F., and Co., Inc.	Inside Front Cover
Du Pont, E. I., de Nemours & Co., Inc.	26
Edward Orton, Jr., Ceramic Foundation	35
Electro Refractories & Alloys Corp.	18
Fate-Root-Heath Co.	22
Foote Mineral Co.	9
Frazier-Simplex, Inc.	25
Georgia Kaolin Co.	34
Great Lakes Foundry Sand Co.	27
Hammill & Gillespie, Inc.	29
Harrop Ceramic Service Co.	20
Harshaw Chemical Co.	12
Hays Corp.	32
Hommel, O., Company	23
Industrial Ceramic Products, Inc.	29
Ingram-Richardson Mfg. Co. of Indiana, Inc.	43
Inland Steel Co.	11
Innis, Speiden & Co.	41
Ironton Fire Brick Co.	14
Kentucky Clay Mining Co., Inc.	21
Lancaster Iron Works, Inc.	2–3
Maxson, Elwyn L.	39
McDanel Refractory Porcelain Co.	29
Metakloth Company	4
Metal & Thermit Corp.	Outside Back Cover
Montgomery Porcelain Products Co.	4
New Castle Refractories Co.	13
Norton Company	5
Orton, Edward, Jr., Ceramic Foundation	35
Pacific Coast Borax Co.	36
Pemco Corp.	4
Pennsylvania Salt Mfg. Co.	16
Photovolt Corp.	37
Potters Supply Co.	41
Professional Directory	39
Remmey, Richard C., Son Co.	*94
Robinson Ventilating Co.	4
Sauereisen Cements Co.	30
Savannah Kaolin Co.	4
Society of Glass Tech.	41
Solvay Sales Corp.	37
Spencer Lens Co.	43
Spinks, H. C., Clay Co.	Inside Back Cover
Stauffer Chemical Co.	*118
Swindell-Dressler Corp.	8
Taylor, Charles Sons Co.	10
Titanium Alloy Mfg. Co.	31
Vitro Mfg. Company	36
Willson Products, Inc.	28
Wilson, H. W., Company	39

* In Bulletin Section

You get the Big "4" when you come to Armco



EXPERIENCE: ARMCO Enameling Iron was the original enameling iron created for commercial use. More of it has been produced over a longer period of time than any other metal enameling base. Through the years, ARMCO Enameling Iron has been constantly improved . . . to give you a sheet with consistently good adherence, uniformity and sag resistance.

SERVICE: For many years Armco's field service organization has worked closely with enamelers — helping them meet special needs, checking on designs, shop practice and other problems. This service is backed by the largest research organization in the flat-rolled steel industry. Experiments at the Armco Enameling Laboratory hold interesting possibilities for porcelain enameling after the war.

ACCEPTANCE: Back in 1914 Armco became the *first* producer to advertise the benefits of porcelain enamel in popular national magazines. For 31 years since then, people have been seeing the familiar Armco triangle trademark. This educational advertising has helped your industry sell millions of porcelain enameled products.

MERCHANDISING AID: The fourth logical step in the complete Armco service to enamelers is close co-operation with its customers in the actual marketing of their products. This includes studies of market potentials and sales organization, territorial analyses, distribution channels, sales education and training, sales-and-advertising aids and point-of-sale promotion.

Perhaps our experience may prove valuable to your production and sales executives in the difficult months ahead. Why not consult with us about your problems? The American Rolling Mill Co., 361 Curtis St., Middletown, Ohio.

FOR EXPORT: THE ARMCO INTERNATIONAL CORPORATION

PORCELAIN ENAMEL ON ARMCO INGOT IRON

HELP FINISH THE FIGHT — WITH WAR BONDS

SWINDELL-DRESSLER CORPORATION

Headquarters for Tunnel Kilns Since 1915

P. O. Box 1888, Pittsburgh 30, Pa.

EVERY TYPE OF CIRCULAR AND STRAIGHT TUNNEL KILN

There Is a Dressler Kiln to Suit Every Manufacturer's Individual Needs!

FOR EVERY KIND OF CERAMIC PRODUCT

•

ALL TEMPERATURES FROM DECORATING TO CONE 32

•

FUEL FIRED AND ELECTRIC

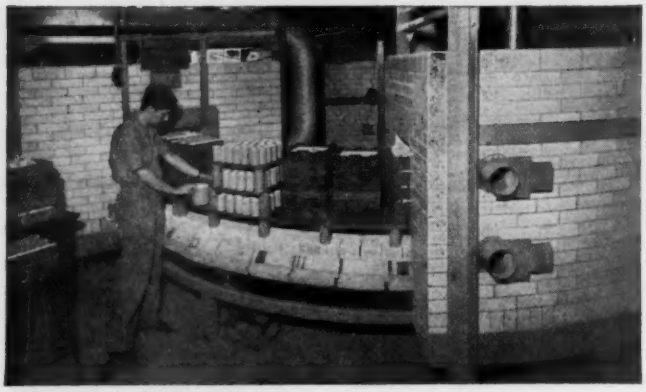
•

Car 9'0" long x 6'9" wide, loaded 5 high—
Carries from 5 to 7½ tons hollow tile.

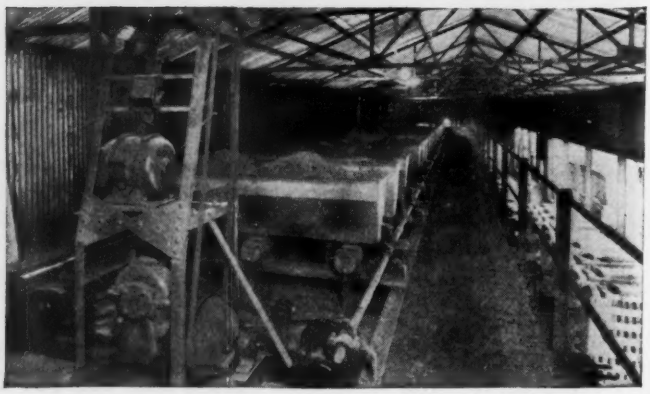
When planning a kiln, call in a Dressler engineer. His experience is at your service.

Re-circulating Gas Tube Roller Hearth Decorating Kiln.

Open placing of Glost Chinaware in "*Thrift*" Muffle Kiln.



Dressler All-purpose Circular Kiln



Automatically stoked, top fired, coal burning tunnel kiln for heavy clay products.

HERE'S A SOUND WAY OUT OF YOUR LEAD RESTRICTION PROBLEMS

THE present curtailment in the use of lead compounds is not the headache for you it would have been several years ago. For now substitutes and research are ready.

Of the leadless glazes developed by the U. S. Potters Association at the Ohio State University Engineering Experiment Station, some of the most promising contain strontium and lithium carbonate. Leadless glazes formulated with strontium and lithium-containing frits appear to equal commercially produced lead glazes in both vitreous and semi-vitreous ware.

POSSIBILITIES FAVOR YOU

Lithium and strontium carbonates hold out two encouraging possibilities for you. Through their use you may be able to develop immediately low lead containing glazes which certainly meet usual production and selling quality standards. Or you may produce glazes with lithium and strontium which have even better appearance, and better physical and chemical properties than your former lead glazes.

HELP AND MATERIALS WAITING

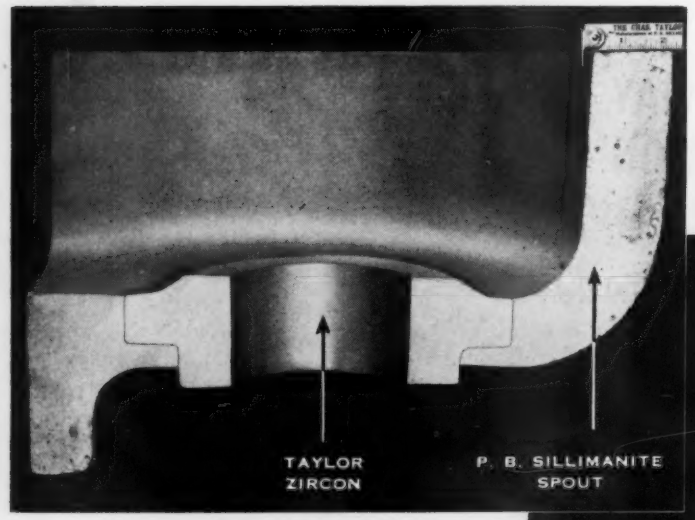
Foote Mineral Company engineers will be glad to help you or supply information on strontium and lithium for glazes. Leadless or low lead frits containing strontium or lithium are available from your glaze frit supplier. Allocation-free strontium and lithium salts can be shipped quickly from our ample stocks.

THE BOMB THAT BECAME A SEED

In a glass bomb such as this, Foote produces pure Ductile Zirconium by deposition. Ductile Zirconium is rapidly increasing in use, becoming the seed of many new and interesting developments. The deposition process, improved and perfected by Foote engineers, is only one example of Foote's forward march in ores, minerals, alloys and chemicals.

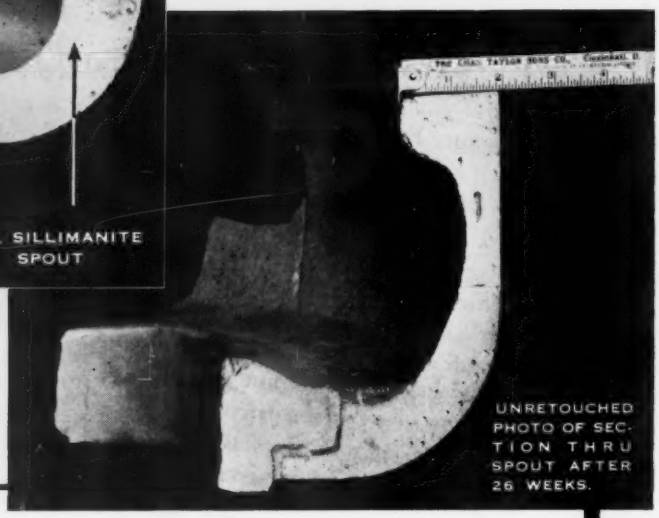
Foote
MINERAL COMPANY
A Step Ahead in Industrial Ores and Chemicals

PHILADELPHIA • ASBESTOS • EXTON, PENNSYLVANIA
Home Office: 1614 SUMMER STREET, PHILADELPHIA 3, PA.
West Coast Repr.: Griffin Chemical Co., San Francisco, Calif. • English Repr.: Ernst B. Westman, Ltd., London, Eng.



BEFORE

AFTER



TAYLOR ZIRCON . . . *for the Glass Industry*

Another case of **'COMBINED OPERATIONS'** . . . this one Taylor-made. P. B. Sillimanite Spout with TAYLOR ZIRCON inserted tube seat combine to prolong the service life of Feeder Spouts —Improve quality of ware—Increase production of heat resisting (boro-silicate) and opal glassware. The following figures, taken from the records of the feeder supervisor of one glass manufacturer, tell a most interesting story.

*Average Life of Feeder Spouts

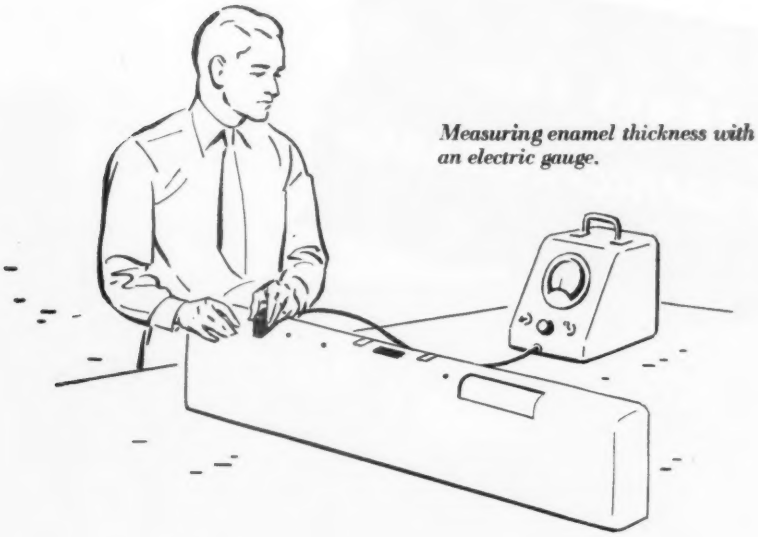
Type of Glass	Standard Spout	P. B. Sillimanite Spout	P. B. Sillimanite Spout With Taylor Zircon Inserted Tube Seat
Boro-Silicate	4 to 6 weeks	8 to 10 weeks	26 weeks
Opal	4 weeks	6 to 8 weeks	20 weeks

*At this plant, spouts are changed when the tube seat has been eroded to the point where it is difficult to hold a uniform gob weight and/or the glass cannot be shut off when an orifice ring is changed. If you are melting either boro-silicate or opal glasses NOW is the time to find out how Taylor Zircon Refractories will increase the production of your Tanks and Feeders. Sorry, Taylor Zircon refractories are **NOT** recommended for ordinary soda-lime glasses.

CHAS. TAYLOR SONS Co.

MANUFACTURERS OF REFRACTORIES • CINCINNATI • OHIO • U. S. A.

WRITE TODAY FOR MORE COMPLETE INFORMATION.



Measuring enamel thickness with an electric gauge.

TI-NAMEL

Another New Creation by Inland Steel Company's Research Laboratories

The long awaited porcelain enameling base, which eliminates the necessity for a ground coat, is here! It is Ti-Namel, the new titanium alloy steel—the newest creation by Inland's research laboratories.

Ti-Namel is superior in every respect to older types of base metals. Its drawing properties are equal to the best deep-drawing steels. It does not age strain no matter how long it remains in storage before fabrication. Inland Ti-Namel Steel does not reboil. Therefore vitreous enamel finishes, equal to the best multi-coat ware, are obtained with white or color coat enamels applied direct to the base metal. This results in a thinner coat which reduces chipping hazards and increases the service-life of the ware.

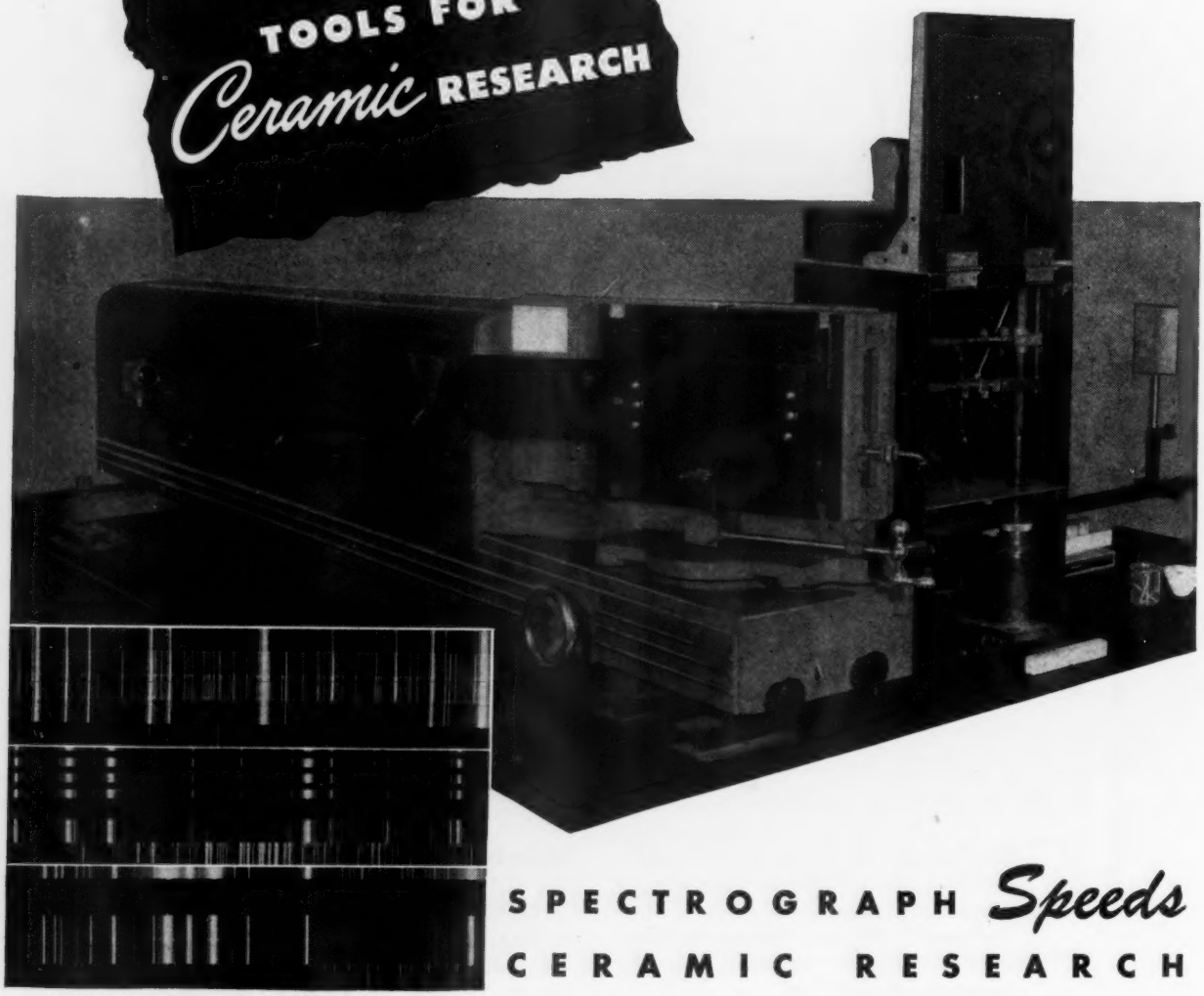
Ti-Namel reduces reoperations, edging, and scrap. It is fired at lower temperatures, and in less time. In short, Inland Ti-Namel Steel increases shop output, lowers manufacturing cost, and assures superior vitreous enameled ware.

Pending patent applications on the new enameling process and product made thereby, are owned jointly by Inland Steel Company and The Titanium Alloy Manufacturing Company under trust agreement.

Write for copy of the Ti-Namel Bulletin and licensing agreement. Inland Steel Company, 38 South Dearborn Street, Chicago 3, Illinois. Sales Offices: Cincinnati, Detroit, Kansas City, Milwaukee, New York, St. Louis, St. Paul.

INLAND STEEL

TOOLS FOR *Ceramic* RESEARCH



Spectrographic patterns of Antimony, Cadmium and Tin.

SPECTROGRAPH *Speeds* CERAMIC RESEARCH

• Harshaw research chemists use the spectrograph for rapid qualitative analysis; and for the precise determination of trace elements. With the spectrograph, Harshaw can quickly determine and correct speck-like defects. The spectrograph helps Harshaw secure and maintain high quality.

Buy from Harshaw with confidence.

COLORS
OPACIFIERS
FRITS
CHEMICALS

HARSHAW

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

"New Castle" REFRACTORIES

SYNONYMOUS WITH QUALITY FOR THE PAST QUARTER CENTURY

MUFFLES • LEHR TILE • DISH SETTERS •
GLOST AND BISQUE SAGGERS • POSTS •
RAMMED AND CAST KILN FURNITURE •
CEMENTS • SPECIAL SHAPES

Our diversified line of Cast, Rammed and Pressed Fire Clay, Sillimanite, Silicon Carbide and other high temperature bodies permits the proper recommendation for your ceramic applications. For the past quarter century we have enjoyed a reputation for service and dependability backed by sound engineering and workmanship.

WEST COAST REPRESENTATIVE AND WAREHOUSE
ELWYN L. MAXSON, 1526 Canada Blvd., Glendale, Calif.

New Castle Refractories Co.
GENERAL OFFICES
NEW CASTLE, PENNA.

RELIABLE REFRACTORIES

MADE FROM

KENTUCKY CLAYS

FOR

GLASS TANK FURNACES
GLASS POT FURNACES
REGENERATORS
TUNNEL KILNS
PERIODIC KILNS
GAS MACHINES
FRIT FURNACES
CHEMICAL PRODUCT FURNACES
MUFFLE FURNACES
LEHRS

Consult Us On Your Refractory Problems

THE IRONTON FIRE BRICK CO.

Reliable Refractories

IRONTON, OHIO

No Crystal Ball at Chicago Vit

Modernizing porcelain enameling plants for more efficient production is the order of the day. We are offering our facilities to solve the problems of production and control. We are drawing plans for enamel plant construction, writing specifications and recommendations.

Chicago Vit is doing this job day after day, introducing new methods of control, showing the way to more and better porcelain enamel production at lower costs.

The Chicago Vit organization is built around a corps of engineers, technicians and service men. They are experts in porcelain enamel frits and porcelain enamel plant operations. There is *no crystal ball* at Chicago Vit. The men in our organization *know* their business.

We will be glad for an opportunity to discuss your problems with you. There is no obligation or cost for this Chicago Vit service.

CHICAGO VITREOUS
ENAMEL PRODUCT COMPANY
Makers of Fine Porcelain Enamels
CICERO 50, ILLINOIS

Coming up!

Kryolith
REG. U.S. PAT. OFF.
NATURAL GREENLAND CRYOLITE

Now you can purchase all necessary quantities of Kryolith . . . the *only* NATURAL GREENLAND CRYOLITE available to the glass, ceramics and enamel industries. Sufficient Kryolith is available to meet the demands of both the domestic and export trade. Here's how Kryolith benefits your particular industry:

Kryolith gives the GLASS industry clarity and lustre through its capacity for dissolving coloring oxides.

Kryolith gives the CERAMICS industry long fluxing action, high opacity and low melting point to speed batch reduction.

Kryolith gives the ENAMEL industry whiteness and greater freedom from chipping or crazing through its low melting point and lasting fluxing action.

Kryolith is available in 500 lb. barrels and 100 lb. bags. Write today for full information.

REG. U.S. PAT. OFF.

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals

1000 WIDENER BUILDING, PHILADELPHIA 7, PA.

NEW YORK • CHICAGO • ST. LOUIS • CINCINNATI • PITTSBURGH • MINNEAPOLIS • WYANDOTTE • TACOMA

B & W 80 FIREBRICK

Economy arithmetic

ONE=THREE

B&W 80 Firebrick outlast first quality fireclay brick three to one in many furnaces—particularly in those that operate at high temperatures and high production rates.

With B&W 80's furnaces can be kept in operation more continuously, without costly interruption for repairs and rebuilding.

Thus the true cost of B&W 80's—on a service-time basis, delivered and installed—is less, in spite of their initial cost.

THE BABCOCK & WILCOX CO.

Refractories Division

85 LIBERTY ST. NEW YORK 6, N. Y.

R-188

ARMY E NAVY

BABCOCK & WILCOX

BUY WAR BONDS! BUY MORE THAN BEFORE

Eminently

Sovereign Potteries, Limited
Hamilton, Ont., Canada

Superior

Regardless of the price classes for which they manufacture, we expect all users of Electro Kiln Furniture to produce eminently superior ceramics within those ranges. ★★ We believe they do because Electro Kiln Furniture adds "do how" to "know how" and gives effectiveness to technical skills. ★★ Electro (Patented) FLOATING Construction reduce the hazards of cracking and sagging, and importantly increase first quality percentage. Profits increase as "seconds" decrease. ★★ While improving the product, Electro Batts reduce cost; permit more pay load per kiln car; permit manufacture in thin sections; and reduce the number of posts per car.

May we send you facts concerning these Batts and tell you, also, why Electro Silicon Carbide helps to make eminently superior Plate Setters? Better still, why not let one of our Ceramic Engineers discuss possible improvements and economies with you in your own plant?

Electro
SLABS • POSTS
MUFFLE TILE
SAGGERS
PLATE SETTERS
SHELF-TYPE
FLOATING
CONSTRUCTION
(Patented)

AD-K-200

Electro REFRACTORIES & ALLOYS CORPORATION

Manufacturers of Kiln Furniture • Crucibles • Refractories • Grinding Wheels • Alloys... Since 1919

344 DELAWARE AVENUE BUFFALO 2, NEW YORK

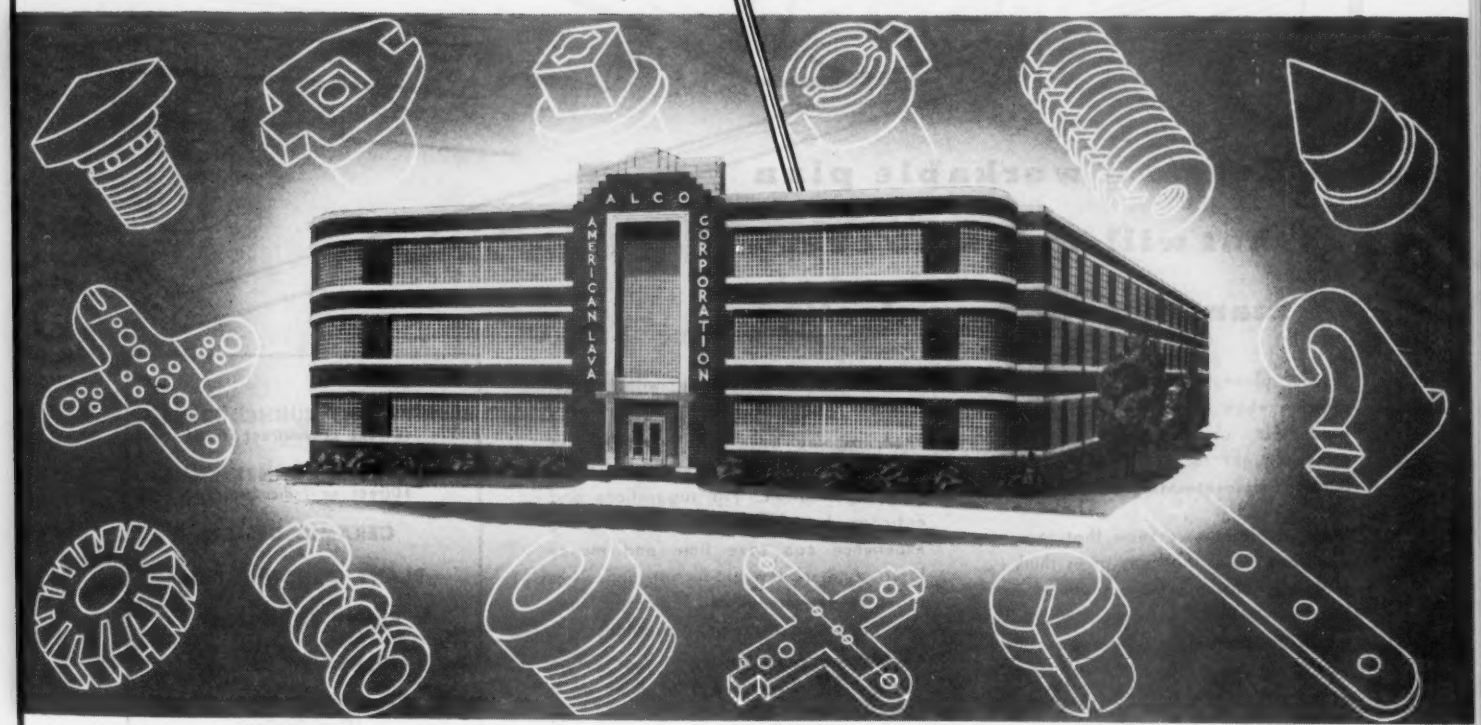
ORIGINAL AWARD JULY 27, 1942

SECOND AWARD FEB. 13, 1943

THIRD AWARD SEPT. 25, 1943

FOURTH AWARD MAY 27, 1944

FIFTH AWARD DEC. 2, 1944



For the fifth consecutive time, the men and women of American Lava have earned the Army-Navy "E" Award "for continued excellence in quantity and quality of essential war production." All of us are very thankful that the necessary knowledge, experience and skill were available at American Lava *to maintain the high standard of quality* of ALSIMAG products, while meeting production schedules that once seemed incredible.

AMERICAN LAVA CORPORATION • *Chattanooga 5, Tennessee*

43RD YEAR OF CERAMIC LEADERSHIP

ALSIMAG

TRADE MARK REG. U. S. PAT. OFFICE

CERAMIC INSULATORS

For Use in:

- Electronic Devices
- Electrical Circuits and Appliances
- Gas and Oil Heating
- Automotive Equipment
- Chemical Processes

IDEA for the Plant with a Future

Here's a workable plan that will appeal to every man in your organization

If your plant is one of those that will prosper when we return to peacetime production, chances are you've given some thought to future plant and production improvements.

Here at Harrop we know that tomorrow is always closer than any of us think . . . that invariably months, sometimes years, pass between the time plans are put on paper and actual installations are made. That's why we suggest a plan of action now . . . for now is the time our service is more useful than ever.

If you'll take a little time to discuss your future needs and your tentative plans with a Harrop engineer, he'll put those plans on paper, incorporating Harrop's wide experience with newest methods and materials.

Then, as you have time, you can go over these plans with every key man in your organization. His suggestions and criticism, based on his actual working experience can save time and money later. And as new production difficulties arise, as new trends are indicated, they can be provided for in your plans.

Contact us today whether your future needs indicate a new kiln, drier or a complete new plant. Let us help you make plans now that will give you an advantage of months or even years, when materials are again available for actual installation. Harrop Ceramic Service Co., Columbus, Ohio.

STRAIGHT TUNNEL KILNS
(Direct or Indirect-Fired)

CIRCULAR TUNNEL KILNS
(Direct or Indirect-Fired)

CERAMIC DESIGN

PLANT CONSTRUCTION

PLANT EQUIPMENT

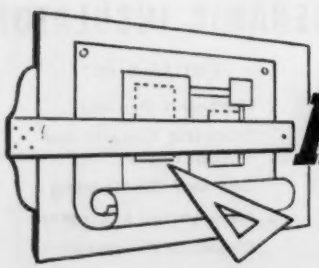
KILNS and DRIERS

FUEL BURNING EQUIPMENT
(Coal-Oil-Gas)

PLANT PROBLEMS

RESEARCH

OUR CATALOG IN CERAMIC DATA BOOK CDB



HARROP CERAMIC SERVICE CO.

Consistently Successful Service For A Quarter Century

QUALITY BALL CLAYS

PRODUCE BETTER WARE

For 25 years we have had the privilege of supplying the pottery industry with dependable, uniform, high quality clays, which have aided in the production of better quality products.

The stratified formation of our pit which enables us to work each layer separately, plus modern mining methods assist in our efforts to furnish you with uncontaminated quality clays, year in and year out.

We operate our extensive mining facilities the year 'round. Our storage facilities are ample to take care of the highest peak loads. Our clays are free from excessive moisture.

We will be pleased to give you information on our clays in place of materials which are difficult to obtain. And, we'll be pleased to send you testing samples, just write us.

KENTUCKY CLAY MINING CO.

INCORPORATED

MAYFIELD - - - - KENTUCKY

"ALL 'ROUND PROFITABLE OPERATION"

THAT'S WHAT OWNERS EVERYWHERE SAY ABOUT F-R-H!

IT takes stamina, dependability and efficiency year in and year out to build the reputation with users that F-R-H Ceramic Machinery has achieved. For example, the Cleveland Pottery, Cleveland, Ohio gave these answers to the following questions:

How do you like the machine? *"Very satisfactory."*

What do you think of it? *"Would find it difficult to return to conventional type."*

What savings are you able to make? *"Very small proportion of finished rejects."*

Have you been able to get better quality? *"Quality very much improved."*

There is no better testimonial to the value of a product than the forth-right approval of the owner. F-R-H Ceramic Machinery is backed to the limit by those who use it. So, if you are looking for equipment that will promise years of satisfactory performance . . . investigate F-R-H. Send for complete catalog now!

THE FATE-ROOT-HEATH CO. **PLYMOUTH, OHIO, U. S. A.**

PLYMOUTH Industrial Locomotives

F·R·H

Clay Working Machinery

SILVER KING Industrial Tractors

What **HOMMEL** *is doing today . . .*

We want to tell you what we are doing today and what we are planning for tomorrow . . . not in a spirit of boastfulness, but in quiet pride that what Hommel is doing is so typical of American industry.

Our PLANT is still busy to capacity on war products that are needed today—that are used on every fighting front. There will be no "let-down" in this direction until the progress of the war clearly permits it.

Our LABORATORIES are working just as hard on still better Frits and Colors to insure the continued growth of our company and to maintain steady employment for our present workers and for the men in the armed forces, who we hope will soon return. A steady flow of new developments is being brought from the idea stage to tested and perfected plans—no incredible miracle finishes, but plenty of solid progress so that porcelain enamel may serve in still better and in more ways than ever before.

Our SALESMEN continue to work closely with their customers—to keep their minds free of a "seller's market" attitude—to aid in the fair distribution of our products—and to help others in the development of their postwar plans.

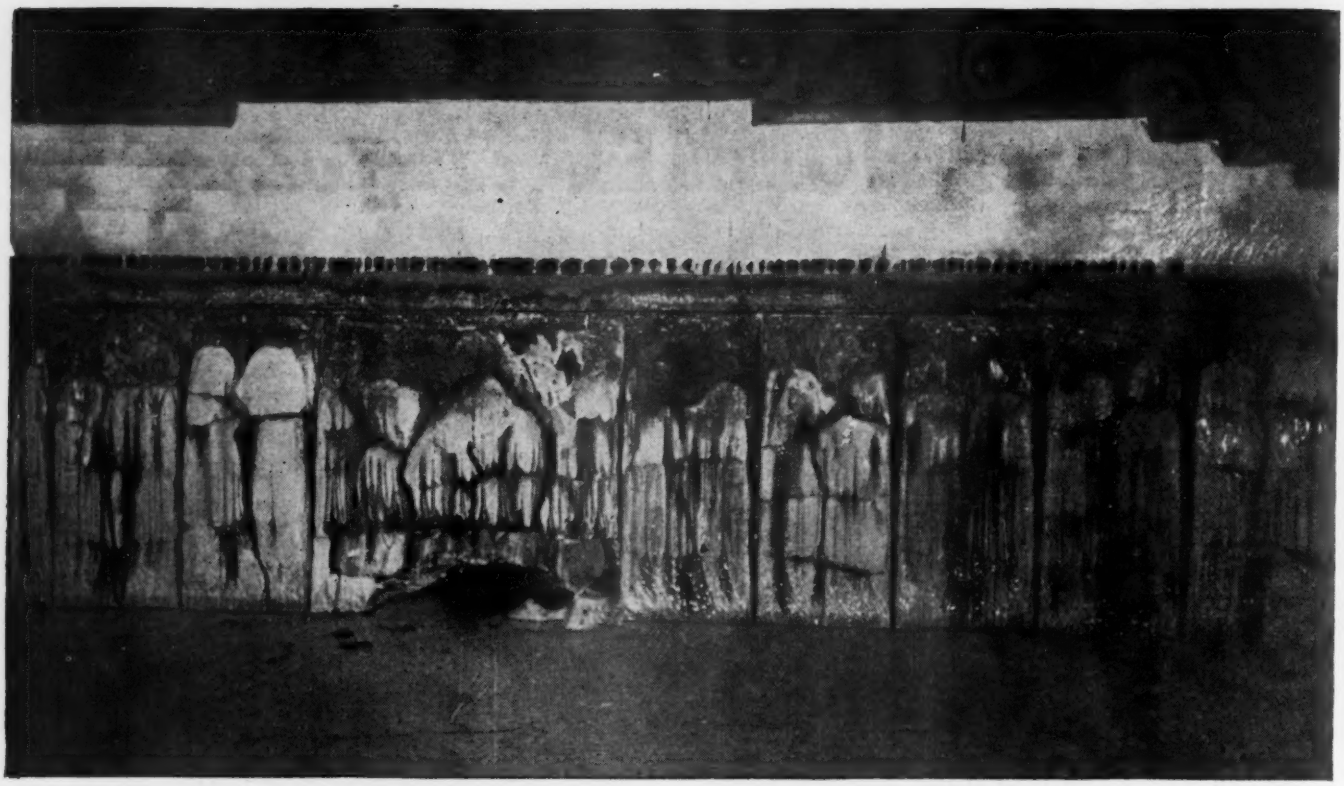
Our MANAGEMENT directs these efforts, and also keeps in close touch with Hommel employees in the armed forces—endeavoring to help wherever they can today, and to see where these men can be re-employed at their maximum skill.

Our PLANNING continues a 55 year record of steady progress—for it is based on a sincere desire to see things from our customers' viewpoint as well as our own.

O. HOMMEL CO.
209 FOURTH AVENUE
PITTSBURGH 30, PENNA.

Pacific Coast Agents
L. H. BUTCHER CO.

World's Most Complete Ceramic Supplier



207.81 Tons of Glass Per Square Foot Per Life!

SEVERAL months ago we reported the operating data of a Corhart Electrocast tank melting flint bottle glass, which had finished its first run, and was then operating on the second run of its campaign. As promised at that time, we are now reporting to you the outcome of the completed *two-run* campaign.

You may remember that on the first run, the tank produced 142.18 tons of glass per square foot. ***On the second run this tank produced 65.63 tons of glass per square foot, for a record of 207.81 tons of glass per square foot per life.***

The operating data for the complete two run campaign is as follows:

Melting Area 440 Sq. Ft.		Total Days Life	Total Operating Days	Idle Days	Total Tons Flint Glass	Tons Glass Per Sq. Ft. Per Life
1st Run	7/3/41 To 11/11/43	860	844	16	62559.19	142.18
	DOWN PERIOD			13		
2nd Run	11/24/43 To 11/15/44	357	352	5	28878.95	65.63
	Total	1217	1196	34	91438.14	207.81

At the end of the first run the Corhart Electrocast sidewalls and throat were left in place for the second run by overcoating at the metal line when repairing the superstructure. At the end of the second run, which was terminated for reasons other than failure, it was found that the overcoating on a portion of the sidewalls, and on the complete bridgewall, had not been needed for this complete campaign. In fact, the operator of the unit has reported that, in his opinion, much additional life still remained at the end of the second run.

If you have never fully investigated the possibilities of Corhart Electrocast balanced tanks, we would appreciate an opportunity to discuss the matter with you.

Corhart Refractories Company, Incorporated, 16th and Lee Streets, Louisville 10, Kentucky.

QUALITY ECONOMY ENDURANCE

CORHART ELECTROCAST REFRACTORIES

Ceramic Abstracts Section

Compiled by

THE AMERICAN CERAMIC SOCIETY

ABSTRACTERS

A. A. Ayars	M. V. Condoide	Max Hartenheim	G. A. Kirkendale	Alexis Pincus	M. A. Schwartz
L. R. Barrett	P. S. Dear	F. G. Heck	B. B. Lane	M. E. Poor	A. B. Searle
W. R. Beck	W. D. Foster	R. A. Heindl	E. D. Maher	H. K. Richardson	Hans Thurnauer
A. C. Bevan	V. D. Fréchette	M. Hoseh	R. W. McAllister	Margaret Roach	E. R. Varley
V. L. Bosazza	R. A. Gregory	F. J. Hurlbut	E. H. McClelland	E. W. Roedder	C. Wentworth
R. G. Capell	P. Grodzinski	G. M. Hutt	E. C. Pierce	B. C. Ruprecht	Samuel Zerfoss

PERIODICAL REFERENCE: The name of the periodical appears in italics, followed by the volume (bold-faced), issue number (in brackets), page numbers, and year (in parentheses).

Vol. 24 **March 15, 1945** **No. 3**

Abrasives

Crystal structure of α-SiC, type IV. LEWIS S. RAMSDELL. *Amer. Mineralogist*, **29**, 431–42 (1944).—A new modification of α-SiC, designated as type IV by Thibault ("Morphological . . . ," *Ceram. Abs.*, **24** [1] 2 (1945)), was found by him to have a rhombohedral unit cell, with a_r = 17.68 a.u. and $\alpha = 9° 58'$; space group $R3m$; $Z = 7$. For comparison with the hexagonal types, the rhombohedral unit can be referred to hexagonal axes, with a_0 = 3.073 a.u. and c_0 = 52.78 a.u. This unit contains 21 formula weights. There are only five possible atomic arrangements compatible with the rhombohedral space group and with the assumption that each Si atom is surrounded tetrahedrally by 4 C atoms and each C atom by 4 Si atoms. Of these five arrangements, only one gives satisfactory agreement between the observed and calculated intensities; it is listed and drawn. Each C atom is directly above a Si atom at a distance of 1.90 a.u.

W.D.F.

Diamond wheel-truing device speeds up grinding operations. C. A. BLACK. *Amer. Machinist*, 88 [26] 115 (1944).—The device consists of a diamond wheel dresser and holder for a surface grinder working on a swivel with a lock nut so that it can be locked in or out of position. This makes unnecessary the breaking down of setups during an operation of the tool to be sharpened.

M.HA.

Dressing of grinding wheels with small steel wheels. W. DAWIHL AND F. LOEW. *Fertigungstechnik*, **1/77**, 161–63 (1943).—Small steel wheels are described, and recommendations are given for their use in the dressing of grinding wheels. P.G.

Dressing tool for grinding wheels. ANON. *Fertigungstechnik*, **1/78**, 6 (1944).—A new tool produced by Pittler Werkzeugmaschinenfabrik, Leipzig, is especially suitable for the truing of smooth grinding wheels. The chief advantage is that the steel disks can easily be exchanged. A cross section of the tool is shown. P.G.

Grinding device for knives. VENNIGER. *Fertigungstechnik*, **1/77**, 174 (1943).—The device can be used on wheel stands. P.G.

Increase in output by measuring and testing during production. W. KAAL. *Fertigungstechnik*, **1/77**, 129–34 (1943).—Defective workpieces cannot be used in interchangeable production. K. discusses (1) damages caused by defective workpieces; (2) nondestructive methods of material testing (Ferropuls crack tester and X-ray radiography); (3) the measuring and testing of workpieces already in the machine (in this case control tolerances must be smaller, influencing the measuring methods to be applied), use of the ultra-micron wedge as an adjustable gauge block for center distances, comparator micrometer, and electrical gauges); (4) the testing of surface finish (Schmaltz light slit method, Linnik interferometer, electron microscope, Busch surface comparator); and (5) automatic measuring and testing, particularly for grinding machines. P.G.

Microid polishing alumina. ANON. *Ind. Diamond Rev.*, **4** [47] 218 (1944).—Polishing alumina for metallographic purposes is manufactured by Griffin and Tatlock, Ltd., London. See "Control. . . .," *Ceram. Abs.*, **23** [8] 133 (1944). P.G.

Truing and dressing grinding wheels with diamond tools. ANON. *Ind. Diamond Rev.*, **4** [42] 109–11 (1944).—International patents are reviewed (Ger. Pat. 709,848, Fortuna Werke, and Ger. Pat. 707,000, C. G. Ekhold, for truing profiled grinding wheels). The Niles gear grinding machine truing device is also described. *Ibid.*, [43] 136–38.—British patents are described ("Grinding-wheel dressers," *Ceram. Abs.*, **22** [6] 96 (1943), and "Normal dresser. . . ," *ibid.*, [8] 132). *Ind. Diamond Rev.*, **4** [44] 158–60 (1944).—The following inventions are explained in detail: (1) Brit. Pat. 554,875 ("Diamond holder . . . ," *Ceram. Abs.*, **22** [10] 168 (1944)); (2) a device for the truing and automatic readjustment of the grinding-wheel face (Ger. Pat. 725,643, R. Frank and J. Ortlieb); (3) operation of feed gear (Ger. Pat. 724,589, Fortuna Werke); (4) cooling internal thread grinding (Ger. Pat. 710,944, K. Tauche and H. Lindner); and (5) adjustment microscope (Ger. Pat. 706,361, H. Lindner). P.G.

X-rays and industrial diamonds. E. J. TUNNICLIFFE. *Ind. Diamond Rev.*, **4** [49] 271–73 (1944).—T. demonstrates that routine inspection of diamond tools by X rays will contribute materially to the maintenance of high quality in tools with consequent minimizing of damage to

workpieces or injury to machine operatives. The article contains eight radiographs and a detailed description and explanation of each tool shown, viz., Newall cube, wheel-truing tool of square shape; Newall chisel, wheel-truing tool of trapezoidal shape; small boring shank in holder, the shank being held by a clamping screw; commutator turning tool; hardness indenter for Shore's scleroscope; and shaped diamond tools in which the diamond was fixed by cold-set methods. The investigations determined the method and security of mounting and the shape, size, and setting of the diamond. P.G.

PATENTS

Abrading machine. G. A. BOURGEOIS. U. S. 2,368,108, Jan. 30, 1945 (Jan. 25, 1944). 4 claims. (Cl. 51-124).

Abrasive article. G. F. KEELERIC. U. S. 2,367,286, Jan. 16, 1945 (June 22, 1943). 10 claims. (Cl. 51-309).—1. A method of making an abrasive tool which comprises distributing abrasive particles upon one surface of a layer of soft material having a thickness dependent upon the desired maximum projection of the particles from the working surface of the tool, partially embedding the particles in the layer by forcing them through the layer from the surface until edges of the particles lie flush with the opposite surface of the layer, bonding the portions of the abrasive particles exposed at the first surface of the layer in a solidified homogeneous body of metal which extends outwardly beyond the portions of the particles, and thereafter removing the soft layer to expose the portions of the particles previously enclosed thereby.

Abrasive bonding alloy. HERMANN KOTT (Fish-Schurman Corp.). U. S. 2,367,407, Jan. 16, 1945 (Dec. 28, 1943; April 18, 1944). 4 claims. (Cl. 75-22).

Abrasive composition of matter and method of forming it. HERMANN KOTT (Fish-Schurman Corp.). U. S. 2,367,404, Jan. 16, 1945 (July 9, 1943). 4 claims. (Cl. 51-309).—1. The method of forming an abrasive composition of matter consisting of small particle sized diamonds dispersed throughout a metallic matrix which comprises surfacing the diamonds with a metal selected from the group of metals consisting of Ag, Au, and Cu, forming a mixture of metal powders consisting of a refractory metal and a bonding metal therefor, the amount of the bonding metal being at least sufficient to effect a sintering of the refractory metal at temperatures approximating but not over 800° to 850°C., incorporating the metal-surfaced diamonds in the metal-powder mixture in an amount within the range 1 part diamonds to 5 to 15 parts of the metal powder, by weight, compacting the diamond-metal powder mixture, heating the compacted mixture under non-oxidizing conditions to a temperature approximating 800° to 850°C. at atmospheric pressure for a short time interval to sinter it, heating the sintered product under reduced pressures for an extended time interval to a temperature within the range 700° to 800°C. to degasify it, immersing the degasified product in a molten silver-solder alloy having a melting point not exceeding 800°C., and removing and cooling the resultant silver-solder impregnated sintered product.

Abrasive composition and method of forming it. HERMANN KOTT AND MURRAY YAWITZ (Fish-Schurman Corp.). U. S. 2,367,358, Jan. 16, 1945 (May 26, 1943). 7 claims. (Cl. 51-309).—1. An abrasive composition of matter consisting of small-sized diamond particles dispersed throughout a metallic matrix, the metallic matrix consisting of an iron-carbon alloy containing carbon within the range 0.45 to 1.0%. HERMANN KOTT (Fish-Schurman Corp.). U. S. 2,367,405, Jan. 16, 1945 (July 9, 1943). 6 claims. (Cl. 51–309).

Apparatus for adjustably holding cutting tools against grinding wheels. P. J. GEBEL. U. S. 2,367,494, Jan. 16, 1945 (April 20, 1943). 5 claims. (Cl. 51-218).

Bonding of abrasive particles. BAKELITE, LTD. Brit. 566,327, Jan. 3, 1945 (Feb. 21, 1942).

Coated abrasive. N. E. OGLESBY (Behr-Manning Corp.). Can. 423,629, Nov. 7, 1944 (May 27, 1942; in U. S. June 9, 1941). G.M.H.

Composition for treating abrasive bodies. J. P. BUCKEY (Electronic Products, Inc.). U. S. 2,367,995, Jan. 23, 1945 (Nov. 2, 1942). 2 claims. (Cl. 51-295).—1. A liquid composition for treating abrasive bodies comprising activated graphite, a cement, a solvent for the cement, and sodium hydroxide.

Curved eyeshield for grinders. S. A. BROWN (Brown-Brockmeyer Co.). U. S. 2,368,109, Jan. 30, 1945 (June 7, 1943). 3 claims. (Cl. 51-272).

Glass article grinding apparatus. J. K. JACKSON (Corning Glass Works). Can. 423,525, Oct. 31, 1944 (Dec. 7, 1942). G.M.H.

Grinding machine. JACOB DECKER AND HANS ERNST (Cincinnati Grinders, Inc.) U. S. 2,367,758, Jan. 23, 1945 (Jan. 10, 1941); divided out of U. S. 2,254,002, Aug. 26, 1941 (June 2, 1939). 10 claims. (Cl. 60-52). JACOB DECKER AND A. D. C. STUCKEY (Cincinnati Milling Machine Co.). U. S. 2,367,759, Jan. 23, 1945 (Aug. 13, 1942). 17 claims. (Cl. 51-165). L. E. MEHLHOPE AND E. D. VANCIL (Cincinnati Milling Machine Co.). U. S. 2,368,-315, Jan. 30, 1945 (March 29, 1943). 7 claims. (Cl. 51-3).

Grinding-wheel dressing. J. H. FINDLATER (Packard Motor Car Co.). U. S. 2,367,857, Jan. 23, 1945 (Dec. 31, 1942). 3 claims. (Cl. 125-11).

Machine for grinding screw threads. THOMAS METCALFE. U. S. 2,367,957, Jan. 23, 1945 (Oct. 8, 1943; in Great Britain Nov. 19, 1942). 2 claims. (Cl. 51-95).

Making abrasive articles. G. F. KEELERIC. U. S. 2,368,473, Jan. 30, 1945 (Nov. 10, 1942). 8 claims. (Cl. 51-309).

Metallic abrasive composition of matter. HERMANN KOTT (Fish-Schurman Corp.). U. S. 2,367,406, Jan. 16, 1945 (Dec. 28, 1943). 9 claims. (Cl. 51-309).

Method and apparatus for smooth-finish gear grinding. E. W. MILLER (Fellows Gear Shaper Co.). U. S. 2,368,-559, Jan. 30, 1945 (May 14, 1942). 4 claims. (Cl. 51-123).

Tool-grinding machine. KURT ZWICK (vested in the Alien Property Custodian). U. S. 2,368,342, Jan. 30, 1945 (March 6, 1941; in Germany Jan. 19, 1940). 7 claims. (Cl. 51-219).

Art and Archeology

Bibliography of works by John Alder Knowles relating to ancient stained and painted glass. ANON. *Jour. Brit. Soc. Master Glass Painters*, **9** [1] 26–29 (1943); abstracted in *Jour. Soc. Glass Tech.*, **27** [123] 229 (1943).—Seventy-three references, dating from 1914 to 1943, are listed.

Fine collection of early Roman glass on display in the Carnegie Museum, Pittsburgh. D. N. *Carnegie Mag.*, Dec., 1942; *Nat. Glass Budget*, **58** [36] 13 (1943); abstracted in *Jour. Soc. Glass Tech.*, **27** [122] 181 (1943).—The exhibition is described with a brief history of the collection, which was assembled by Elbert Eli Farman, formerly U. S. Consul-General at Cairo and Judge of the International Court of Appeals at Alexandria. The exhibit consists of both artistic and utilitarian pieces dating probably from the 1st and 2d centuries. 2 illustrations.

Notes on the salvage of the damaged glass of Exeter Cathedral. FRANCIS W. SKEAT. *Jour. Brit. Soc. Master Glass Painters*, **9** [1] 15–21 (1943); abstracted in *Jour. Soc. Glass Tech.*, **27** [123] 229 (1943).—A preliminary report is given. The total number of main lights (excluding all tracery) damaged or destroyed is approximately 341 (including all glass, both old and modern, whether plain or painted). Few windows escaped damage. 26 illustrations.

Stained glass of the Tower of London. WILFRED DRAKE. *Jour. Brit. Soc. Master Glass Painters*, **9** [1]

24–25 (1943); abstracted in *Jour. Soc. Glass Tech.*, **27** [123] 229 (1943).—The ancient stained glass in the chapel of St. John in the White Tower, including thirty examples of English armorials and nine of Continental origin, was removed to a place of safety. The medallions and panels (which were inserted in the Norman windows when the chapel was restored) came from the collection of Horace Walpole of Strawberry Hill when that collection was sold at auction in 1842. The chapel retained its white glazed leaded windows.

University of Illinois recipient of Heinrich Ries collection. ANON. *Bull. Amer. Ceram. Soc.*, **24** [2] 70–71 (1945).—1 photograph.

War and the medieval glass of York. F. HARRISON. *Jour. Brit. Soc. Master Glass Painters*, **9** [1] 22–23 (1943); abstracted in *Jour. Soc. Glass Tech.*, **27** [123] 228 (1943).—A brief account is given of the work of removing to places of safety the old windows of York Minster and some of the parish churches of York.

SEPARATE PUBLICATION

Small Scale Pottery Manufacture. J. GLOVER AND L. GOLDSTUCKER. *East African Industrial Research Board* [Nairobi] *Tech. Pamphlet*, No. 10, 15 pp. (1944).—The development of a small pottery industry in East Africa consequent on the shortage occasioned by the war is traced. Formerly, pottery was made by native women according to tribal custom, and the product was the unglazed cooking pot. These methods were inadequate to produce the quantities required, and natives were trained in the use of the potter's wheel. Relatively simple equipment was used, all of which was constructed locally. Production is largely of mugs, milk jugs, beakers, cups and saucers, and teapots. Three out of every four ordinary African laborers could be trained to use the wheel without difficulty, the most skillful turning out 120 cups a day and the less skillful 80 to 90 cups a day. Draft estimates of costs of production are given. Illustrated. E.R.V.

PATENTS

Vase design. JOHN POPPER. Can. 13,883, 13,884, and 13,889, Oct. 25, 1944. G.M.H.

Cements

Long-time volume changes of Portland cement bars. ALFRED H. WHITE AND HAROLD S. KEMP. *Proc. Amer. Soc. Testing Materials*, **42**, 727–41 (1942).—The authors present a continuation of studies reported in 1911, 1914, and 1928. Over 450 bars of known history are available for study and have been observed for 17 to 41 years. The autoclave test did not cause excessive expansion of these old bars except where they contained larger amounts of magnesia than are permitted by the standard specifications. Not all of the bars containing high magnesia expanded in the autoclave test, since it apparently detects only free magnesia and not magnesia in combination. **Discussion.** H. H. VAUGHAN. *Ibid.*, pp. 742–49. W.R.B.

Phase composition and binding properties of alumosilicate cement. N. A. TOROPOV AND V. V. SEROV. *Zhur. Priklad. Khim.*, **17** [3] 170–77 (1944).—According to chemical composition, alumosilicate cement occupies an intermediate place between white Portland cement and alumina cement. Crystalline phases of alumosilicate cement consist of alumosilicate (gehlenite, $2CaO \cdot Al_2O_3 \cdot SiO_2$, β- and γ-modifications of calcium orthosilicate, calcium aluminates ($5CaO \cdot 3Al_2O_3$ and $CaO \cdot Al_2O_3$), and magnesium aluminate ($MgO \cdot Al_2O_3$). Between the content of gehlenite in alumosilicate cement and the strength of the building mortar obtained exists a straight-line inverse relationship, formulated by the authors as a gehlenite rule of alumosilicate cement.

Theory and measurement of plasticity and workability of mortars. PAUL S. ROLLER. *Proc. Amer. Soc. Testing Materials*, **42**, 750–60 (1942).—The plasticity of mortars is measured on the basis of a stress-strain relation that had been formulated previously. Two constants are determined, coefficient of plasticity, π, and yield value, p_0, only p_0 depending on the mixing water content. Plasticity is defined in terms of ease of deformation and interpreted as one of the factors of workability, of which four are discussed. The other three factors are (1) tendency to rupture during plastic flow, (2) tendency to suspension of plastic flow, and (3) water retention. π is shown to determine plasticity and to be a good measure of over-all workability. Water retention was measured directly and with p_0 at 16.7% mixing water as an index. It was found to be well correlated with π for a series of 1:3 mortars of Portland cement with added mineral powders. Relative to these materials at the same plasticity, the water retention of 1:3 mortars of several masonry cements and a slag cement seemed to be low. Theoretical factors involved in plasticity and workability are discussed. W.R.B.

Enamel

Electrostatic spraying. RICHARD E. HELMUTH. *Finish*, **2** [1] 19, 48 (1945).—The electrostatic spraying process uses an electric field to precipitate enamel sprayed from an automatic spray gun onto the panel or item to be coated. High voltage is established by means of a power pack, which charges particles entering the field. On deposition, the particles lose their charge and build up a uniform film of enamel. W.R.B.

How wartime products kept an enameling plant in operation. C. R. WAINSCOTT. *Finish*, **2** [2] 15–17 (1945). W.R.B.

How and why of sign advertising: X, Roadside signs. KEN M. DAVEE. *Finish*, **2** [1] 21–24 (1945).—Users of roadside sign advertising are listed, and its effectiveness is evaluated. Means of erecting the signs and the financial considerations are discussed. **XI, Specialized sign uses.** *Ibid.*, [2] 21–23, 50.—Advertising of industrial establishments and the identification of municipalities are considered. Signs on trucks prove very effective. Street and highway signs and their suggested standardization are described. A summary is given. For Parts **VIII** and **IX** see *Ceram. Abs.*, **24** [2] 37 (1945). W.R.B.

Pickling tanks. N. R. KLEIN. *Finish*, **2** [1] 20, 50 (1945).—New pickling tanks were constructed, using acidproof brick and acidproof phenolformaldehyde cements. The design and the service obtained are outlined. W.R.B.

Porcelain enamel for ship construction. ELSA GIDLOW. *Finish*, **2** [2] 11–14 (1945).—G. describes the use of porcelain enamel for bulkheads on the U. S. Hospital Ship Marigold and lists the expanding uses of ceramic coatings on shipboard. W.R.B.

Porcelain enameled metal chimneys. L. P. BROWN. *Finish*, **2** [1] 11–14, 46 (1945).—There is a potential market for porcelain enameled metal chimneys to replace masonry chimneys. The six basic requirements for a chimney are outlined. Resistance to corrosive action of flue gases is of prime importance. The principal advantages are (1) elimination of foundation, (2) greater draft per foot of chimney height, (3) lower exterior surface temperatures, (4) quick and easy installation, (5) lower cost, and (6) rapid heating and cooling with better draft and higher efficiencies for automatic heating equipment. W.R.B.

Corrosion-resistant materials in pickling, cleaning, and plating operations. EDWARD ENGEL. *Products Finishing*, **8** [9] 68–80 (1944).—Fourteen factors are listed as causes of corrosion and are discussed in detail. Two tables show (1) the solution potentials of various metals and alloys in sodium chloride, and (2) the usual and alternate choice of container material for various types of solutions.

TABLE II

This table does not present the results of a conclusive investigation; the listed choices were indicated in a limited survey.

Pickling, cleaning, plating solutions and operations	Materials for tanks—lining	
	Usual choices	Alternate choices
Water, dyes, acid salt solutions	Steel	Wood, Monel
Acid pickling, electrolytic pickling	Lead	Chemical brick, glass, rubbers, Monel, carbon, ceramics, asphalt
Ferric sulfate pickling	Lead, glass, chemical brick	Ceramics, asphalt
Stainless and chrome steels pickling	Lead	Ceramics, asphalt
Cold nitric solution	Lead, asphalt, aluminum, 18–8 stainless	Chemical brick, glass, ceramics, rubbers
Hot nitric solution	Chrome, iron, lead, aluminum, 18–8 stainless	Chemical brick, glass, ceramics, rubbers
Fire-off pickling	Lead, chrome iron	Chemical brick
Hydrofluoric acid and mixtures, fluoride electrolytes	Lead, carbon, asphalt	Wax, rubbers, phenolic resinoids
Alkaline and electrolytic cleaners	Steel	Copper, Monel, asphalt
Petroleum solvent degreasers	Steel	
Chlorinated solvent degreasers	Monel	Steel
Electrolytic polishing of metals	Asphalt, ceramic s	Chemical brick, rubbers, steel, copper
Bonderizing and phosphate solutions	Steel	Chemical brick, ceramics, glass
Alkaline electrolytes (Cu, Zn, Cd, Sn, In, Ag, etc.)	Steel	Chemical brick, ceramics, glass
Acid electrolytes (Cu, Ni, Cr, etc.)	Lead	Chemical brick, rubber, glass, ceramics, plastics
Black nickel electrolyte	Carbon, rubber	
Iron black-oxide solutions	Steel	Same as phosphates or caustic solutions
D.-c. aluminum anodizing, H_2SO_4	Lead	Rubber
A.-c. aluminum anodizing, H_2SO_4 and modifying salt	Glass, chemical brick	Carbon
A.-c. or d.-c. chromic acid anodize and K or Na dichromate solutions	Steel	Lead, glass, chemical brick
Magnesium anodizing	Steel	
Aluminum plating passivators	Steel	Ceramics, 18–8 stainless steel
HCl and iron chloride electrolyte	Chemical brick, hard rubber, antimonial lead	Hastelloy A, glass, ceramics (copper Si-Mn alloy), plastics

H.K.R.

Progress report on the program of white enamels applied directly to the base metal: Application of white enamels direct to sheet steel. G. H. MCINTYRE. *Finish*, 2 [1] 26, 42 (1945). **Special alloy steel aids "white on steel" development.** FRANK R. PORTER. *Ibid.*, pp. 27–28; *Stove Builder*, **10** [2] 36, 38, 46–50 (1945).—Carbon in the metal is the cause of many of the defects in the process and indirectly the cause of heavy applications. The addition of titanium to the steel stabilizes the carbon and prevents its reaction with the enamel at the usual temperatures. It also imparts better drawing qualities, better sag resistance, and better enameling properties. Stove parts have been satisfactorily finished with enamel coatings 0.006 to 0.009 in. thick. These show a reflectance of 67 to 73%. Cobalt ground coats may be used, but they can be eliminated if pickling is carried on under carefully controlled conditions and if a nickel strike is used. See "Will...," *Ceram. Abs.*, **23** [4] 70 (1944). W.R.B.

Relation of test methods to quality standards for production. A. I. ANDREWS. *Finish*, **2** [2] 18–20 (1945).—The relation of test methods to their use in establishing quality standards for production can conveniently be divided into three parts: (1) the test, (2) application of the test, and (3) the personnel. Test methods should incorporate (1) simplicity and convenience, (2) simple, rugged equipment, (3) dependable results promptly obtained, and (4) ease of interpreting results. Typical test methods are discussed, and the three successful tests now used for kitchenware are described. The personnel problem and the probable future lack of trained personnel are discussed. W.R.B.

Review of porcelain enameling quality control. R. F. BISBEE. *Better Enameling*, **15** [9] 4–12 (1944).—The procedure of maintaining and controlling the quality of enameled ware is discussed. B.C.R.

Standard thermal-shock test for porcelain enameled utensils. F. A. PETERSEN AND A. I. ANDREWS. *Jour. Amer. Ceram. Soc.*, **28** [2] 36–41 (1945).—15 references, 7 figures.

Tin oxide opacifiers in vitreous enamels. ANON. *Tin and Its Uses*, No. 8, pp. 12–13 (Jan., 1941); *Enameling Abs.*, **1** [8] 61 (1941).—A survey is given of the history and present position of tin oxide and other opacifiers in the enameling industry. Tin oxide has maintained its position, although other opacifiers are also now in use. F.J.H.

Use of potassium dichromate method in determining iron content of pickle acids. EDWARD G. PORST. *Jour. Amer. Ceram. Soc.*, **28** [2] 62–64 (1945).—7 references.

SEPARATE PUBLICATION

Refresher Course in Porcelain Enameling. Edited by J. E. HANSEN. Enamelist Publishing Co., 4150 East 56th St., Cleveland 5, Ohio, 1945. 120 pp. Price $1.00. Reviewed in *Bull. Amer. Ceram. Soc.*, **24** [2] 71 (1945). See *Ceram. Abs.*, **23** [11] 187 (1944).

PATENTS

Baked enamel finish. H. S. JORDAN (Canadian Marconi Co.). Can. 423,110, Oct. 10, 1944 (Aug. 15, 1942). G.M.H.

Enamel coating for ferrous metals. A. E. CHESTER (Poor & Co.). Can. 423,320, Oct. 17, 1944 (April 27, 1943). Can. 423,321, Oct. 17, 1944 (May 11, 1943). G.M.H.

Enameled hot-water tank. W. S. GAINES AND E. H. MEYERS (Porcelain Steels, Inc.). Can. 423,683, Nov. 7, 1944 (April 23, 1942; in U. S. April 26, 1941). G.M.H.

Vitreous enamel. L. J. FROST AND C. H. COMMONS, JR. (Titanium Alloy Mfg. Co.). Can. 423,569, Oct. 31, 1944 (Dec. 23, 1943). G.M.H.

White-opacifying iron enamel. VEREINIGTE CHEMISCHE FABRIKEN KREIDL, HELLER & Co. Ger. 734,068; *Chem. Zentr.*, **1943, II** [6] 165.—If the opacification is made by gaseous opacifiers, a frit is used which has in the batch a fluorine content due to cryolite of not less than 8%, preferably between 8 and 12%; whereby, however, the frit, with normal or approximately normal boric acid content, is as free as possible of Al_2O_3, which is not introduced by cryolite. Example: 22 borax, 18 cryolite, 4 soda, 2 saltpeter, and quartz 54%. M.HA.

Glass

Effect of temperature on homogenizing rate of soda-lime-silica glass. R. L. TIEDE AND F. V. TOOLEY. *Jour. Amer. Ceram. Soc.*, **28** [2] 42–47 (1945).—4 references, 6 figures.

Factors influencing fluxing action of various oxides in low-temperature borosilicate glasses. HOWARD R. SWIFT. *Jour. Amer. Ceram. Soc.*, **28** [2] 33–36 (1945).—4 references, 3 figures.

Fibrous glass insulation. A. M. ROBERTSON. *Elec. Rev.*, **132**, 247–48 (1943); abstracted in *Jour. Soc. Glass Tech.*, **27** [121] 71 (1943).—Fibrous glass offers a Class B insulation with a space factor comparable with that of the commonly used Class A materials. Electrically, the chief demand is for "continuous" glass-fiber yarn, tape, and sheet, wherein the fibers are of virtually infinite length in contrast to the 6- to 15-in. fiber lengths in "staple" types of yarn. All weights of continuous yarn are produced from the same basic thread consisting of 102 filaments, each approximately 0.0002 in. in diameter. This thread is produced to a standard of 90,000 yards per lb. After twisting and doubling, the thread may be used either for wire covering or for weaving. For electrical purposes, an alkali-free glass is necessary, since it possesses good dielectric strength, high insulation resistance, and good weathering properties. Weathering may assume serious proportions in an alkaline glass in the fiber form where the exposed surface is enormous in comparison with the weight of the glass involved. Fibrous glass, in a form much coarser than textile fabric, is used in the construction of accumulators. The life of heavy-duty secondary cells has been increased by the use of retainer mats made from tangled layers of coarse glass fibers, which act as a trap to hold the paste in place on the cell plates and prevent loose particles from dropping to the bottom of the cell.

Fundamental process of glass polishing. WERNER KLEMM AND ADOLF SMEKAL. *Naturwissenschaften*, **29** [45/46] 688–90 (1941); abstracted in *Jour. Soc. Glass Tech.*, **27** [122] 172 (1943).—The question of whether amorphous-plastic displacements of matter play a role in glass polishing (apart from bodily removal of matter) has been decided in tests. Microscopical specimen scratches were produced on polished optical glass SF2 with slightly loaded scratching tools (diamonds, sapphire needles, steel gramophone needles). The maximum depth of these rather smooth microscopical scratches was 0.3 mμ, and the width was 0.5 mμ. Etching or microscopic observation showed that at the crossing of two scratches a tiny polished surface was produced. A similar effect had been observed on polished quartz glass and crystalline quartz and on freshly broken surfaces of glass and synthetic sapphires. The polishing process is assumed to be produced by a summation of the flattening-out effects at numerous intersections of scratches. Heavier loads on the scratching needles produced the well-known deep, sharp "diamond scratches." 4 illustrations.

Glass in electronic tubes. H. C. STEINER. *Bull. Amer. Ceram. Soc.*, **24** [2] 56–62 (1945).—4 references, 17 figures. See *ibid.*, **23** [4] 140–46 (1944).

Glass-fabric jig devised for drilling contoured surfaces. E. PRONO AND J. M. BUTLER. *Amer. Machinist*, **89** [1] 87 (1945).—A glass-fabric structure built up in 19 layers was developed as a jig for locating and drilling holes perpendicularly on a surface of a double curvature. It consists of 19 layers of fiber glass cloth ECC-142 impregnated with a catalyzed phenol formaldehyde resin (Baker No. 102078) mixed with one part of No. 102052 catalyst in 5-lb. batches. The whole is bonded together with fiber-glass tape EC-11A. The complete assembly is then cured for 96 hr. at 180°F. in an oven. M.HA.

Glass fiber textiles. ANON. *Jour. Textile Inst.*, A428–29 (Oct., 1942); abstracted in *Jour. Soc. Glass Tech.*, **27** [121] 73 (1943).—A general account is given of the production of staple-fiber and continuous-filament yarns from glass and their use in textiles. The Owens-Corning Fiberglas Corp. produces seven types of Fiberglas and invites suggestions for the application of the material in technology. Possible fields are (1) as reinforcing fibers in plastics, (2) filtration, (3) evaporation and fractionation of liquids, (4) removal of liquid particles from air streams, (5) as substitutes for metal, jute, hemp, and other fibers, and (6) in mixtures with other fibers.

Investigations of the application of Swedish feldspar to the manufacture of glass. J. A. HEDVALL AND N. ABERG. *Tek. Tid.*, **72** [41] 73–75 (1942); abstracted in *Chem. Zentr.*, **1943, I** [6] 664.—The feldspars investigated proved to give a good addition to the glass batch if ground sufficiently fine and intimately mixed with the other batch. The melting process is favorably influenced (time of melting is reduced and the viscosity of the melt is increased, which necessitates a longer soaking time). The additions amounted to 5 and 10%. The shorter melting time reduced the fuel consumption. The glass obtained is free of bubbles, and its resistance to alkalis, brightness, and mechanical strength are improved. M.HA.

Light has no effect on commercially glass-packed foods. J. J. POWERS, W. B. ESSELEN, JR., AND C. R. FELLERS. *Glass Packer*, **1943**, 528–30; abstracted in *Jour. Soc. Glass Tech.*, **27** [123] 239 (1943).—Two years' storage of commercially canned and bottled and home-bottled fruit and vegetables showed that light had no effect on color or flavor. Oxygen in the free space is a major factor, and the addition of vitamin C and related ascorbic acid compounds as antioxidants greatly improves the keeping qualities. The greater deterioration of foods bottled by home methods is due to the larger head space in the jars. Storage temperature is also an important factor. Details and tables of tests are given. See "Does. . . ," *Ceram. Abs.*, **22** [7] 115 (1943).

Miracles in glass. L. STOUFFER. *Science News Letter*, **47** [2] 26–28 (1945).—S. describes glass that can be sawed and nailed like lumber, bent like rubber, twisted into yarn, tied into knots, and woven like silk and is able to float and bounce. G.A.K.

Properties of optical glasses with chemically changed surfaces. H. SCHROEDER. *Z. Tech. Physik*, **23**, 196–208 (1942); abstracted in *Chem. Zentr.*, **1943, I** [8] 875–76.—The properties of surface layers of glasses that have been refined by the action of acid are not constant; their transparency decreases more or less according to the type of glass. The reflectivity complementary to the transparency changes with temperature and gas atmosphere and has a different course in heating after the refining than in cooling. If a certain temperature is exceeded (which differs with the type of glass and depends on the thickness of the refined layer), the final value of reflectivity at room temperature lies below the original value if the refining was carried out sufficiently far enough over the transparency maximum, and it is above the original value if the glass was refined to just about the maximum transparency. The deviation between these curves disappears only after heating to 300° to 400° C. The changes in reflectivity are ascribed to reversible and irreversible effects of sorption, temperature, and pressure of the absorbed gases. See "Influence. . . ," *Ceram. Abs.*, **20** [11] 261 (1941). M.HA.

Proposed method of test for diffuse transmission of blackout material for incandescent lamp light. ANON. *Proc. Amer. Soc. Testing Materials*, **42**, 438 (1942). W.R.B.

Rapid ring and ball softening-point test. D. M. WILSON. *Jour. Soc. Chem. Ind.* [London], **62** [9] 140–41 (1943).—A. B. Hersberger and C. Overbeck suggested an ingenious modification of the normal ring and ball softening-point test (*Proc. Amer. Soc. Testing Materials Preprint*, No. 78, 3 pp. (1942)). Instead of raising the temperature of the testing bath at a regular rate of increase and recording the temperature at which the ball drops 1 in., the time is taken for the ball to drop the same distance in a bath at constant temperature. The temperature is chosen according to the approximate range within which the sample is expected to soften. Graphs can be drawn showing the relation at each bath temperature between the time required to drop 1 in. and the ring and ball softening point as determined by the standard method. The published details were followed by W., but many difficulties were experienced in getting satisfactory repeat results. Eventually, while keeping to the principles suggested, certain modifications were introduced, and the method has proved to be most useful for rapid routine control purposes.

Recent optical (glasses and other) materials and their possible applications. B. K. JOHNSON. *Proc. Phys. Soc.* [London], **55**, 291–300 (1943); abstracted in *Jour. Soc. Glass Tech.*, **27** [123] 242 (1943).—Optical glasses recently

introduced include (1) phosphate glasses having refractive index 1.52 and dispersion (ν) 70, (2) zinc borate glasses having refractive indices 1.63 to 1.65 and ν values 50 to 55, and (3) zirconium-, titanium-, tungsten-, thorium-, lithium-, and boron-containing glasses having refractive indices 1.71 to 1.87 and ν values 54 to 19. The relations between wave length and refractive index and absorption coefficient are shown graphically for LiF, NaCl, and KBr crystals.

Required minimum and optimum wall thicknesses of luminescent glasses in fluorescent tubes. H. FISCHER AND A. SCHÖNTAG. *Z. Tech. Physik*, **23**, 193–196 (1942); abstracted in *Chem. Zentr.*, **1943, I** [6] 664.—To obtain the optimum light from colored luminescent glasses, a definite wall thickness is required which must lie above a minimum wall thickness, S_m, because of the increasing luminosity with increasing thickness of the layer, and yet must not be too thick because of the increasing absorption of the visible light of the discharge with the thickness of the layer. This optimum wall thickness, S_o, and the minimum S_m, were determined for three uranium glasses (69.4SiO_2, 2.4Al_2O_3, 4.1B_2O_3, 4.1CaO, 0.3F, 12.4Na_2O, 5.2K_2O, and 0.036F_2O_3 with 2.1, 1.05, and 0.7 UO_3, respectively). The optimum wall thickness for the three glasses is 0.12, 0.25, and 0.7 mm., respectively, but the absolute magnitude of the optimum luminescence lies in the low UO_3 contents. Besides the thickness of the layer, the absolute UO_3 concentration is also important in attaining a maximum yield of light. M.HA.

Treatment of discolored quartz windows. A. G. GAYDON. *Jour. Sci. Instruments*, **19**, 123 (1942); abstracted in *Jour. Soc. Glass Tech.*, **27** [122] 172 (1943).—The purple coloring on quartz windows developed after prolonged exposure to high-intensity short-wave ultraviolet radiation is readily removed by heating the windows to dull red, during which period the coating phosphoresces bright green. Evidence shows that the original transparency in the far ultraviolet (1800 to 2300 a.u.) is not regained by heating.

SEPARATE PUBLICATION

Place of Glass in Building. Edited by JOHN GLOAG. With contributions by LIONEL B. BUDDEN AND G. A. JELLICOE. 90 pp. + 15 text figs. and 40 halftone illustrations. George Allen & Unwin, Ltd., London, 1943. Price 7s, 6d. Reviewed in *Jour. Soc. Glass Tech.*, **27** [121] 110 (1943).

PATENTS

Apparatus for presizing glass tubing. J. C. SMITH (MacGregor Instrument Co.). U. S. 2,368,169, Jan. 30, 1945 (Dec. 10, 1941). 11 claims. (Cl. 49-7).

Decoloration and cleansing agents for glass, consisting of crystal water containing alkali meta-antimonate. DEUTSCHE GOLD- UND SILBER-SCHEIDEANSTALT VORM. ROESSLER. Fr. 874,694; *Chem. Zentr.*, **1943, I** [6] 665. M.HA.

Electric incandescent lamp. I. H. VAN HORN (Canadian General Electric Co., Ltd.). Can. 423,912, Nov. 21, 1944 (March 19, 1942). G.M.H.

Electric lamp. C. A. COTMAN AND D. W. WRIGHT (Canadian General Electric Co., Ltd.). Can. 424,323, Dec. 12, 1944 (June 23, 1944). D. K. WRIGHT (Canadian General Electric Co., Ltd.). Can. 424,324, Dec. 12, 1944 (Nov. 10, 1942). G.M.H.

Glass bead machine. SEYMOUR SCHUMANN. Can. 424,187, Dec. 5, 1944 (April 20, 1944). G.M.H.

Glass envelope for electric sun lamps. HARRY KALSING, HERMANN KREFFT, AND KURT LARCHÉ (General Electric Co.). U. S. 2,367,871, Jan. 23, 1945 (March 16, 1942; in Germany Dec. 22, 1939). 2 claims. (Cl. 106-53).—1. An ultraviolet-transmitting glass, impervious to ultraviolet radiations of wave lengths shorter than about 280 μ and having a substantially constant ultraviolet-transmission characteristic, containing 72 SiO_2, 11.5 K_2O, 6 Na_2O, 0.5 Al_2O_3, and 10% PbO.

Glass-fiber processing. J. F. HYDE (Fiberglas Canada, Ltd.). Can. 424,228, Dec. 5, 1944 (June 16, 1941). G.M.H.

Glassforming machine. G. F. JARDINE (Hazel-Atlas Glass Co.). U. S. 2,368,472, Jan. 30, 1945 (Oct. 21, 1941). 6 claims. (Cl. 49-19).

Glassmelting electrical furnace. E. V. BOREL (Pilkington Bros., Ltd.). Can. 423,565, Oct. 31, 1944 (Aug. 11, 1937 and July 12, 1941; in Germany Aug. 14, 1936 and June 5, 1937). G.M.H.

Glass metallization. RALPH NEWTON-MAY. Can. 423,080, Oct. 10, 1944 (April 27, 1940). G.M.H.

Glass-to-metal seal. A. W. HULL AND LOUIS NAVIAS (Canadian General Electric Co., Ltd.). Can. 423,514, Oct. 31, 1944 (April 2, 1940). G.M.H.

Glass-molding machines. MULLARD RADIO VALVE CO., LTD., AND C. F. M. HAYES. Brit. 566,070, Dec. 29, 1944 (March 2, 1943).

Glass for the production of fibers or threads. W. EITEL AND A. DIETZEL. Ger. 727,779; *Chem. Zentr.*, **1943, I** [6] 665.—The glass contains, besides SiO_2, Al_2O_3, and TiO_2, also thorium oxide and ZrO_2, and the sum of the acid oxides, including alumina, titanium, thorium, and zirconium, is not less than 80%. An example of a glass that can be spun to the finest fiber is composed of 60 SiO_2, 5 Al_2O_3, 10 TiO_2, 10 ZrO_2, and 15% Na_2O. M.HA.

Glass solution and coating. R. N. WENZEL (Canadian Westinghouse Co., Ltd.). Can. 423,790, Nov. 14, 1944 (April 22, 1942). G.M.H.

Glasses with high expansion. H. FISCHER. Ger. 728,308; *Chem. Zentr.*, **1943, I** [8] 877.—The glasses have (1) a total alkali content of 35 to 38%, in which the ratio of the weight of Na_2O to K_2O is between 1:1 and 5:1, the content of Mg (by weight) is 3 to 6%, of Al_2O_3 3 to 5.5%, and of ZnO 2 to 5%, and an eventual CaO content amounting to 1% max.; (2) a BaO content of 2 to 4% (by weight); and (3) a B_2O_3 content of up to 4%. The glasses are particularly suitable for use with metals and alloys of high thermal expansion. A good composition is 44.25 SiO_2, 5 Al_2O_3, 2 Be_2O_3, 6 MgO, 3 BaO, 3.5 ZnO, 0.25 CaO, 27.50 Na_2O, and 8.5% K_2O. M.HA.

Laminated safety glass. L. D. KESLAR (Pittsburgh Plate Glass Co.). Can. 423,442 and 423,443, Oct. 24, 1944 (Jan. 6, 1942). G.M.H.

Luminaire. HOLOPHANE, LTD. (Holophane Co., Inc.). Brit. 566,189, Dec. 29, 1944 (June 9, 1943). KURT FRANCK (Holophane Co., Inc.). U. S. 2,368,014, Jan. 23, 1945 (Feb. 10, 1943). 3 claims. (Cl. 240-106.1).

Machine for fabricating glass. J. C. SMITH (MacGregor Instrument Co.). U. S. 2,368,170, Jan. 30, 1945 (May 7, 1942). 12 claims. (Cl. 49-7).

Method and apparatus for sealing jars, etc. ANCHOR HOCKING GLASS CORP. Brit. 566,059, Dec. 29, 1944 (June 1, 1942).

Preparation of glass testing pieces. VICTOR WALKER (AlnCin, Inc.). U. S. 2,367,704, Jan. 23, 1945 (Dec. 26, 1940). 14 claims. (Cl. 88-14).—1. The method of preparing a glass stock piece having reduced transparency surfaces for visual-inspection purposes including the steps of rough grinding a pair of opposed surface portions thereof to generally plane form, removing therefrom the surface light-screening substances resulting from the grinding processes by means of an acid-reaction process adapted to avoid production of glass etched effects, and wetting the opposed surfaces with a suitable wetting agent.

Quartz-tungsten seal. C. D. SPENCER (Canadian General Electric Co., Ltd.). Can. 423,517, Oct. 31, 1944 (June 30, 1942). G.M.H.

Reheating and re-forming of glass articles. D. E. GRAY (Corning Glass Works). U. S. 2,367,495, Jan. 16, 1945 (Dec. 9, 1941). 8 claims. (Cl. 49–7).

Spray method of making mirrors. CHARLES TREVAIL AND K. P. GLADNEY (Hobbs Glass, Ltd.). U. S. 2,367,903, Jan. 23, 1945 (Feb. 25, 1944; in Canada Sept. 3, 1943). 5 claims. (Cl. 117-35).—2. A method of coating a surface with a reflecting film of silver.

Weighing and sorting apparatus. WILLIAM OWEN (Pittsburgh Plate Glass Co.). U. S. 2,368,321, Jan. 30, 1945 (Aug. 8, 1942). 7 claims. (Cl. 209-121.)

Structural Clay Products

Colors of building brick and the factors which control them. A. B. SEARLE. *Claycraft*, **18** [2] 62–66 (1944).—The colors of brick are largely due to impurities in the materials of which the brick are made. Iron compounds chiefly occur in the form of ferrous carbonate, ferric hydroxide, nontronite, and ferrous or ferric sulfate. The shade and tone of colors depend on the presence of other impurities, the size of the particles, and the atmosphere inside the kiln. To insure the most brilliant red, every care must be taken to burn out any carbonaceous matter at so low a rate that the burning is under control. If the combustion occurs too rapidly at about 700° to 750°C., reducing conditions will occur. Manganese compounds impart a brownish tint to brick, copper compounds produce greens and blues, and cobalt compounds give blue colors. Buff brick are made of material containing a small percentage of iron and a high proportion of alumina. Stone-colored brick are made by mixing ground limestone and a red-firing clay. Black brick are rich in manganese and iron. G.A.K.

Opportunities for clay industry in insulation. ANON. *Brick & Clay Record*, **106** [1] 31–33, 69 (1945).—Lightweight insulating brick can be adapted to the construction of cold-storage lockers and private homes. The method of manufacture and means of application are described and illustrated. B.C.R.

PATENT

Manufacture of slag brick. F. SCHWARZ. Ger. 728,340; *Chem. Zentr.*, **1943, I** [16] 1710.—Brick are made of granulated blast-furnace slag and calcined lime by the steam hardening process and by adding to slags with more than 8% MgO and over 2% MnO such acid substances or solutions that form with the added lime a buffer mixture with a pH below 10.5. Suitable buffer mixtures are obtained if, to the necessary lime addition, phenol, phenol-containing waters, waste waters from the steam drying of lignite, fresh humic acid, etc., are added. M.HA.

Refractories

Action of chlorine on refractory materials: III, Effect of chlorine treatment on the physical and chemical properties of some commercial products. H. M. RICHARDSON, F. H. CLEWS, L. R. BARRETT, AND A. T. GREEN. Reprinted in *Trans. Brit. Ceram. Soc.*, **43** [9] 179–85 (1944).—Firebrick, magnesite, chrome, and diatomite products were treated with chlorine at 1000°C. Firebrick was found to be relatively resistant to attack, although enough iron oxide was removed to cause resistance to disintegration by carbon monoxide at 450°C. Volatilization of the constituents of magnesite and chrome products resulted in a large reduction in the cold crushing strengths of these brick. Purification of the diatomite was effected by the chlorine treatment, with the result that the working temperature of the new product could be increased to about 1100°C. For Parts I and II see *Ceram. Abs.*, **22** [3] 53 (1943). [EDITOR'S NOTE: Part III in *Trans. Brit. Ceram. Soc.*, with the exception of two additional pages, is the same as Part IV in *Gas Research Board Commun.* (*Ceram. Abs.*, **21** [10] 212 (1942))]. R.A.H.

Action of steam and sulfur dioxide on refractory materials: I, Action on fire clay at 1200°C. L. R. BARRETT, N. E. DOBBINS, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 52, p. 57 (Oct., 1939); reprinted in *Trans. Brit. Ceram. Soc.*, **43** [9] 155–70 (1944). **II, Action on fire clay at 600°C.** F. H. CLEWS, N. E. DOBBINS, AND A. T. GREEN. *Ibid.*, pp. 170–79. For Part I see *Ceram. Abs.*, **20** [2] 45 (1941); for Part II see *ibid.*, **21** [1] 13 (1942). R.A.H.

American suspended silica roof. FRANK D. HAZEN. *Proc. Nat. Open Hearth Conf. Amer. Inst. Mining Met. Engrs.*, **27**, 322–25 (1944).—This roof is arched and ribbed. It is used because (1) it has the approximate contour of a sprung-type roof; (2) the furnaceman cannot blame a lagging furnace on the arch contour; (3) it keeps cracked tile from falling; and (4) it eliminates extra front- and back-wall height. The work is planned to give the bricklayers adequate space. All metal parts are outside and seldom need replacement. W.D.F.

Basic roofs, current and prospective applications. H. M. GRIFFITH. *Proc. Nat. Open Hearth Conf. Amer. Inst. Mining Met. Engrs.*, **27**, 332–33 (1944).—A 50-ton furnace has a half-basic and half-silica roof. The basic roof was repaired at 214, 400, 568, 727, and 784 heats and taken off for general repair at 909 heats. The silica roof was rebuilt twice, and the basic roof was only partially rebuilt. The basic end cost four times as much as the silica end originally. Labor and material cost was 25¢ per ton of steel for the basic roof and 12¢ for the silica. See "Open...," *Ceram. Abs.*, **23** [4] 73 (1944). W.D.F.

Behavior of metal plates in a basic refractory at a temperature of 3000°F. L. S. LONGENECKER. *Proc. Nat. Open Hearth Conf. Amer. Inst. Mining Met. Engrs.*, **27**, 314–21 (1944).—Full-joint laminated-plate reinforcing as now used in the basic open-hearth roof may cause spalling instead of preventing it. The plates melt part way back in the first heat, leaving an open joint, which causes spalling. The unmelted plate oxidizes and grows thicker, which may squeeze off the inner ends. A new development is a partial-joint plate. It does not extend into the inside face. This face does not require any metal plate reinforcing. The plate is placed in a cup in the brick so that it is protected by a refractory shield. The cup is deeper than the plate to allow for oxidation. W.D.F.

Behavior of refractory materials under stress at high temperatures. F. H. CLEWS, H. M. RICHARDSON, AND A. T. GREEN. Reprinted in *Trans. Brit. Ceram. Soc.*, **43** [11] 223–46 (1944); see *Ceram. Abs.*, **23** [5] 89 (1944). R.A.H.

Beryllium oxide, a special refractory: I. E. R. YARHAM. *Brick & Clay Record*, **105** [3] 50, 52 (1944).—Ceramic products of beryllium oxide are gastight at 2200°C., resist molten alkalis but are very susceptible to acid attack, and have higher strength above 1400°C. than Al_2O_3, ZrO_2, ThO_2, and synthetic $MgO{\cdot}Al_2O_3$. BeO is easily fluxed with CaO, alkalis, or fluorides. Nitrocellulose binders may be used for extruded ware; aluminum nitrate formed by drying a mixture of powdered aluminum and nitric acid is also used as a binder. **II.** *Ibid.*, [4] 64, 66.—Crucibles, boats, and tubes of BeO have been successfully cast, thus simplifying the manufacturing process. BeO crucibles showed less volatilization in contact with carbon at 2000°C. than MgO. Methods of preparing BeO from raw beryl are described. B.C.R.

Carbon refractories meet severe temperature conditions. NATIONAL CARBON CO., INC. *Brick & Clay Record*, **105** [2] 40, 42 (1944).—The principal features of carbon and graphite refractories are (1) resistance to severe thermal shock, (2) nonwettability by molten metals, (3) mechanical strength at high temperature, (4) less thermal expansion, (5) no deformation at high temperature, (6) high or low thermal conductivity, and (7) good electrical conductivity. A temperature of 170°C. represents the limit of safety for Karbate, unless provision is made for adequate heat dissipation. Physical properties for different types of brick are given. B.C.R.

Development of a refractory highly resistant to thermal shock. G. A. LOOMIS. Presented at meeting of American Ceramic Society, April, 1944, Pittsburgh; abstracted in *Ind. Heating*, **11** [6] 978–79 (1944). M.HA.

Disintegration of refractories by CO gases. J. F. McMahon and J. R. Tinklepaugh. Presented at meeting of American Ceramic Society, April, 1943, Pittsburgh; abstracted in *Ind. Heating*, **10** [12] 1866 (1943). M.Ha.

Dry-pressed insulating refractory. P. G. Herold, W. E. Crockett, and C. W. Dougan. Presented at meeting of American Ceramic Society, April, 1943, Pittsburgh; abstracted in *Ind. Heating*, **10** [8] 1208–10 (1943).—A good insulator is produced from a mixture of 25% carbonaceous clay, −50 + 60 mesh, 35% carbonaceous clay, −60 mesh, and 40% pyrophyllite (1% bentonite in the mix) with 20% water addition, using 280 lb. per sq. in. or greater forming pressure. The finer grain sizes of carbonaceous clay cause an increase in fired weight, as the clay grains segregate in the finer grain sizes while the coarse material is composed of larger amounts of carbonaceous matter. The dry strength is too low when a forming pressure below 280 lb. per sq. in. is used. M.Ha.

Gun mixtures. I. A. Nicholas. *Proc. Nat. Open Hearth Conf. Amer. Inst. Mining Met. Engrs.*, **27**, 331–32 (1944).—A gun mixture is a refractory that can be applied through an air gun. It is used for furnace insulation, in soaking pits, on furnace walls, etc. The kind used depends on the kind of repairs to be made. One mix for a vertical basic wall was 50% magnesite and 50% refractory chrome ore. A half-inch layer was applied after the furnace had received its first scrap and was somewhat cool. W.D.F.

Gunmix. R. A. Schoenlaub. *Proc. Nat. Open Hearth Conf. Amer. Inst. Mining Met. Engrs.*, **27**, 326–31 (1944).—S. is improving the methods and materials for hot repairs of basic furnaces. A suitable refractory is forcibly emplaced by compressed air through the hot furnace and onto the hot surface needing repair. The added refractory must (1) have negligible bounce and dribble, (2) stick to smooth vertical walls, (3) hold together when steam evolves, (4) withstand rapid temperature increase, and (5) remain solidly attached. A special gun is used; it weighs 150 lb. and applies 40 lb. of refractory per minute. The present gun is designed for electric furnaces up to 25 tons; a larger gun is being designed. The refractory should be applied at furnace temperatures between 800° and 2200°F. The refractory is magnesite plus dolomite. W.D.F.

Innovations in coke-oven design. M. D. Curran. Presented at conference of Association of Iron and Steel Engineers, Sept., 1942, Pittsburgh; abstracted in *Ind. Heating*, **9** [12] 1652–54 (1942).—The coke-oven design used in the Curran-Knowles process was planned to produce more reactive coke, simplify equipment, improve by-products, and reduce cost. The particular feature is a horizontal coking chamber in which the coal lies in a thin horizontal layer. Ordinary firebrick can be used for the greater part of the construction, and silica brick are used in the flues and for the bottom of the coking chamber. The ovens are of the regenerative type. The fusion zone travels vertically as coking proceeds. Distillation products leave the ovens at about 700°F.; traveling upward through uncoked coal, they preheat the latter so that fuel-gas consumption is lowered. In the regenerators, the combustion products cool from 2500° to 500°F. before going to the stack. Coking rate is approximately 1.25 in. per hr., and the fuel requirement is about 2,000,000 B.t.u. per ton of coal coked. The uniformity of heating over the wide hearth of the coking chamber is so good that this type of oven is also used as a muffle-type furnace for heating retorts for the manufacture of magnesium metal. In this case Carborundum hearths are installed instead of silica-brick hearths to take advantage of the higher heat conductivity of Carborundum. See "Curran. . . ," *Ceram. Abs*, **20** [10] 243 (1941). M.Ha.

Looking forward. Anon. *Brick & Clay Record*, **106** [1] 49–61 (1945).—Although estimates of the consumption of refractories in the postwar period vary considerably, it is believed that it will approximate between 110 and 150% of the 1925–27 average. Consumption of refractories will be as follows: steel industry 50, public utilities 20, nonferrous metals 6 to 10, cement and lime products 5, ceramics 3, and export trade about 10%; the glass and oil refining industries will require increased amounts of refractories. Postwar production forecasts of these groups are given in detail. B.C.R.

Refractories for hot blast stoves of iron blast furnaces. Mervin A. Fay. *Brick & Clay Record*, **105** [5] 52, 54, 56 (1944).—Stove temperatures range from 300°F. at the bottom to 2500° to 2600°F. at the top. Load-bearing ability, high density, and low thermal-expansion coefficient are the most desired properties for stove brick. Uses of low, intermediate, and high heat duty firebrick are discussed. Semisilica brick may be used advantageously in the well, the dome, and in the top third of the checkers. B.C.R.

Refractories for the iron blast furnace. Mervin A. Fay. *Brick & Clay Record*, **105** [3] 44, 46, 48 (1944). B.C.R.

Refractory practice in malleable air furnaces. Ray A. Witchey. *Brick & Clay Record*, **105** [6] 29–31 (1944).—W. describes the construction, operation, and refractories requirements of a malleable iron furnace. B.C.R.

Seek new refractories markets to increase tonnage produced. Anon. *Brick & Clay Record*, **105** [2] 46 (1944).—*Brick & Clay Record* refutes the present thesis that the refractories industry is a shrinking industry due to lower refractories consumption per furnace resulting from improved refractories. Organized market research could yield large dividends to the industry by developing new uses for refractory products. The use of refractories in heating stoves, gas infrared heating, centrifugal casting, incinerators, as a replacement for acid-resisting alloys, and in the gas pickling process are mentioned as a few suggestions. B.C.R.

Some considerations on the manufacture of refractory insulating products. J. F. Clements, L. R. Barrett, and A. T. Green. *Bull. Brit. Refrac. Research Assn.*, No. 66 (Jan., 1944); reprinted in *Trans. Brit. Ceram. Soc.*, **43** [10] 187–222 (1944).—Insulating brick are manufactured by methods which fall naturally into five divisions: (1) the incorporation of natural or synthetic lightweight material, such as diatomite, expanded vermiculite, or raw kyanite, (2) the inclusion of materials which are later removed by combustion or sublimation, (3) the production of a cellular structure by mechanical beating, using a frothing agent, (4) the formation of gas bubbles in a semi-fluid medium by chemical reaction, and (5) several miscellaneous methods. The comparatively small amount of information in the literature relating to the first and second categories has been collected and is discussed in the light of modern developments in other branches of refractories manufacture. Special attention is given to the possibility of increasing the plasticity of clay-combustible mixtures by special selection of the clay, chemical or other treatment, or the addition of a plasticizing agent. The influence of the kind of combustible and its ash on the properties of the fired brick is illustrated by considering coal and sawdust. The semidry process is suitable for nonplastic mixes such as those for porous silica brick or for mixtures containing porous grog. A process that is attracting much attention at the present time is that of frothing a clay slip to which is added a quantity of fine grog, followed by casting, drying, and firing in a normal manner. The process is particularly adapted to making very lightweight brick. Attention is drawn to the work of G. A. Bole and coworkers on the chemical bloating process, the products of which are comparable in properties to those made by the frothing process. See *Ceram. Abs.*, **23** [5] 90–91 (1944). R.A.H.

Use of slips, deflocculants, and hot water in preparation of fire-clay grog bodies. W. A. Hedden. Presented at meeting of American Ceramic Society, April, 1943, Pittsburgh; abstracted in *Ind. Heating*, **11** [4] 618–20 (1944). M.Ha.

Uses of permeable refractories for furnace construction. R. H. Anderson, D. C. Gunn, and A. L. Roberts. *Jour. Inst. Fuel*, **17**, 169–87 (1944); *Gas Jour.*, **244** [4236] 117–

21; [4241] 273–74 (1944); *Brit. Chem. Phys. Abs.*¬*BI*, **1944,** Nov., 366; see *Ceram. Abs.*, **23** [9] 152 (1944).
L.R.B.

PATENTS

Bonded silicon carbide refractory. J. P. SWENTZEL (Carborundum Co.). Can. 423,800, Nov. 14, 1944 (Oct. 3, 1941; in U. S. Sept. 25, 1940). G.M.H.

Furnace wall. ROLFE SHELLENBERGER AND F. X. GILG (Babcock & Wilcox Co.). U. S. 2,368,265, Jan. 30, 1945 (July 27, 1940). 4 claims. (Cl. 122-6).

Refractory. EUGENE WAINER AND D. S. HAKE (Titanium Alloy Mfg. Co.). Can. 424,565, Dec. 19, 1944 (May 8, 1941). G.M.H.

Refractory composition. EUGENE WAINER (Titanium Alloy Mfg. Co.). Can. 424,737, Dec. 26, 1944 (June 7, 1943). G.M.H.

Zircon refractory. R. K. SMITH (Corning Glass Works). Can. 424,216, Dec. 5, 1944 (Aug. 7, 1943). G.M.H.

Whiteware

Hygienic requirements of glazed sanitary ware. G. NORDGREN. *Tek. Tid.*, **71** [10] 77–82 (1941); *Bldg. Science Abs.*, **17** [6] 102 (1944).—The properties of sanitary ware have not hitherto been investigated from the medicohygienic standpoint. It has, however, been realized that much of the sanitary ware on the market is not satisfactory in this respect. Of importance are freedom from cracking of glaze and a suitable degree of porosity of the clay body if the absorption of contaminated water and bacteria by the material, e.g., of closet pans, is to be avoided. The question of the standardization of sanitary ware was taken up by the Hospitals Standards Committee (Sjukhusens standardiseringskommitte) in 1940, and investigations have been carried out at the Hygienic Institute of the Karolingska Institute (Karolinska institutets hygieniska institution) and at the State Testing Laboratory (Statens Provningsanstalt). An account is given of experiments on specimens cut from sanitary ware obtained from 10 different factories. The experiments included sterilization tests with ultraviolet radiation of specimens with glaze on one surface or without glaze to which a bacterial suspension had been applied, observation of the depth to which organic matter penetrated the specimens, and determination of the water absorption. It was found that an uneven glaze surface in general harbored bacteria and that a smooth glaze surface was easily rendered sterile. In some cases, bacteria had penetrated too deeply into the clay body for sterilization to be effective. In general, it was concluded that if the penetration of impurities and bacteria through cracks is to be prevented, the water absorption of sanitary clayware bodies, taken as a measure of porosity, should be less than 0.4%. If a definite guarantee is required that such absorption will not take place, the water absorption of the body should be below 0.26%.

Raw leadless whiteware glazes. C. G. HARMAN AND HOWARD R. SWIFT. *Jour. Amer. Ceram. Soc.*, **28** [2] 48–52 (1945).—5 references, 11 figures.

Recommendations affecting standards for electrical insulating materials. ANON. *Proc. Amer. Soc. Testing Materials*, **42**, 371–80 (1942). W.R.B.

Shaping and molding of small ceramic structural parts. J. WALLICH. *Z. Ver. Deut. Ing.*, **88** [1/2] 9–14 (1944).—The quantity production of small devices and apparatus which must have high thermal resistance, dielectric strength, low dielectric losses, permanence of shape, and rigidity is described. Frequently a device is composed of several standard parts which are manufactured individually and then glazed together. The ceramic masses used are fired at about 1400°C., whereby they shrink and become thoroughly dense. Numerous drawings show the correct and incorrect methods of molding and shaping the pieces. Pieces of great length are made by extrusion. In glazing together, the parts are first ground at the joints so that the interstices are very small and then fired in a muffle at 850° to 900°C. with an enamel liquid at this temperature; they remain unchanged in their dimensions and shape as they have been fired previously at 1400°. Ceramic and metal parts are combined by firing a silver coating on the ceramic part so that it can be soldered to the metal without a layer of air between the two parts.
M.HA.

Strength investigations of sanitary earthenware. O. FORSMAN. *Tek. Tid.*, **72** [2] 10–15 (1942); *Bldg. Science Abs.*, **17** [6] 102 (1944).—The Hospitals Standards Committee (Sjukhusens standardiseringskommitte) is considering the standardization of sanitary ware, beginning with standards for the strength of ware used for washbowls and closet pans. On the initiative of Gustavsbergs Porcelain Factory, a preliminary investigation was planned of the products on the market. The results were communicated to the State Testing Laboratory (Statens Provningsanstalt) with the request that comparative tests of the most commonly used types of washbowls be carried out. It was considered that these results together with those of Nordgren ("Hygienic...," this page) would serve as a satisfactory basis for standards to meet the requirements of durability and hygiene. For the experiments carried out by the State Testing Laboratory, specimens were cut from washbowls originating from 14 different factories. As a measure of porosity, the water absorption, as a percentage of the dry weight of the test specimens, was obtained, and the compressive, bending, and impact strengths of the products were determined. Measurements were made of the change in length of specimens exposed to steam at 15 atm. in an autoclave. The resistance of the glaze to cracking was tested by 4 cycles consisting of exposure to water vapor at 10 atm. for 30 min. in an autoclave followed by immediate cooling with water. A few tests were also made by immersing a washbowl first in boiling water and then in cold water. Certain of the tests were carried out at the Gustavsberg Factory. An illustrated account is given of the method of testing, and the results are shown and considered. On the basis of the results of all the investigations mentioned, the Swedish Standards Committee (Sveriges standardiseringskommission) has drawn up a provisional standard, SSK-117, for sanitary earthenware, covering material, conditions, and tolerances. The chief requirements mentioned are as follows: The glaze shall be smooth and uniform and free from pores visible to the eye on examination in an oblique beam of light. The water absorption value obtained as the mean of tests of two specimens from the same vessel shall not exceed 0.40%. Four cycles of the autoclave test shall not cause the glaze to crack. The bending strength of the ware (the mean value of tests of at least 3 bars from the same vessel), shall be at least 550 kg./cm.^{2} The standard is regarded as provisional pending the conclusion of experiments to determine the resistance of the finished product to temperature changes and the most suitable method of testing if such a test is found necessary. The principle of cooperation in such investigations of manufacturers, testing institute, and standardizing body seems to be suitable for application in other cases.

Studies on base-exchange phenomena in clays and ceramic materials: I and II. D. A. HOLDRIDGE AND MARCUS FRANCIS. *Tech. Paper Brit. Pottery Research Assn.*, Jan., 1940; reprinted in *Trans. Brit. Ceram. Soc.*, **43** [8] 131–54 (1944).—In Part I a short review of the literature is given with particular reference to the bearing of the base-exchange phenomenon on certain problems encountered in the pottery industry. Reference is made to work carried out in America, principally on the china clays and kaolins, in which base-exchange capacity is shown to

have a marked influence on the green properties of clays. Part II contains the results of experimental work on the base-exchange capacity of certain ball clays. The method of extracting the exchangeable ions is explained, and a detailed method of analysis is appended. The total exchange capacity of the clays was determined, and it has been shown that all the clays examined are unsaturated with respect to metallic ions. The clays are therefore capable of sorbing metallic ions in amounts in excess of the total quantity of metallic ions which they yield on leaching. Consequently, it seems evident that it will be possible to alter the properties that depend on sorbed ions within comparatively wide limits, and preliminary experiments support this conclusion. The different metallic ions present in the clays can be removed with varying degrees of ease. Calcium and magnesium are immediately replaceable, whereas sodium and potassium are only progressively so. This has led to a differentiation of these ions based on their position either within or upon the clay particles. Base-exchange and soluble salts both vary with the source of origin of the clays, and they seem to offer a means of identification. R.A.H.

Study of glaze penetration and its effect on glaze fit: I–III. EVERETT THOMAS, MILTON A. TUTTLE, AND ESTHER MILLER. *Jour. Amer. Ceram. Soc.*, **28** [2] 52–62 (1945).—2 references, 8 figures.

Study of the quality of high voltage insulator glaze by the method of chemical silvering. S. K. DUBROVO. *Zhur. Priklad. Khim.*, **17** [1–2] 39–51 (1944).—Chemical silvering of glazed porcelain represents a sort of indicator for the microstructure of its fire-polished surface. The silvering method permits characterization of the state of the surface, the precise classification of the various types of glazes, and the study of the chemical resistance of glaze solution to strong alkalis.

PATENTS

Dinnerware-decorating machine. G. B. GUTHRIE. U. S. 2,367,722, Jan. 23, 1945 (Feb. 11, 1943). 35 claims. (Cl. 91-12).

Drying of pottery ware. SWINNERTONS, LTD., AND R. B. BLOORE. Brit. 565,989, Dec. 20, 1944 (Feb. 12, 1943).

Metal-ceramic joints and electric discharge apparatus incorporating such joints. MULLARD RADIO VALVE CO., LTD., AND L. M. MYERS. Brit. 565,950, Dec. 20, 1944 (April 2, 1943).

Spark plug. T. G. MCDOUGAL (General Motors Corp.). Can. 423,817, Nov. 14, 1944 (Jan. 18, 1943; in U. S. Jan. 23, 1942). G.M.H.

Spark plugs. P. R. MENA. Brit. 566,146, Dec. 29, 1944 (Oct. 20, 1942). P. E. HALSTEAD. Brit. 566,161, Dec. 29, 1944 (June 11, 1943). N. HOLMES. Brit. 566,-270, Jan. 3, 1945 (July 27, 1944). D. H. STOLTENBERG. U. S. 2,367,445, Jan. 16, 1945 (Dec. 19, 1942). 15 claims. (Cl. 123-169). M. F. PETERS AND J. E. D. MCCARTY (McCarty assignor to Firestone Tire & Rubber Co.). U. S. 2,367,840, Jan. 23, 1945 (Sept. 13, 1943). 10 claims. (Cl. 123-169).

Equipment and Apparatus

Applicability of the microhardness test as a diagnostic aid in ore microscopy. J. SIEBEL. *Metall u. Erz*, **40** [11/12] 169–74 (1943).—The determination of the constituents of a mineral ore is most conveniently and correctly made with the Vickers impression method by the diamond pyramid, but certain precautions must be observed with respect to selection of load and method of preparation of the sample. Several ores were investigated with the Diritest (Zeiss), the load being left on for 20 sec. Although the values sometimes varied considerably, the average always agreed well with the values of other measurements. A relation to Mohs' hardness, however, could not be established.

Mineral	Mohs' hardness	Microhardness
Cinnabar	2–2.5	18, 17
Sternbergite	2–2.5	17, 20, 20
Galena	2.5	67, 68, 69
Gold	2.5–3	70
Calcite	3	190
Antimony	3–3.5	11, 12
Enargite	3–3.5	97
Famatinite	3.5	227
Copper pyrite	3.5–4	166, 169, 181
Zinc blende	3.5–4	171, 173
Tin pyrite	4	133
Manganite	4	568, 575, 584, 598
Fluorspar	4	164
Magnetic pyrites	4	214
Wolframite	5–5.5	285, 321, 325
Lollingite	5–5.5	498, 500
Limonite	5–5.5	295
Hausmannite	5–5.5	428, 429, 432
Magnetite	5.5	477
Ilmenite	5–6	404
Chromite	5.5	449, 986, 1001
Arsenide of cobalt	5.5–6	610, 621
Rutile	6–6.5	612
Braunite	6–6.5	728, 743, 745

Values which were found to differ greatly can be neglected as they may have been influenced by crystals under the test spot. In general, it was found that the highest hardnesses were the most correct. M.HA.

Automatically controlled suction device for field air sampling. A. SETTERLIND. *Amer. Jour. Pub. Health*, **34** [8] 863–70 (1944).—In obtaining samples of air for analysis, the chief difficulty in sampling is the inability to accurately maintain a constant flow of air. The construction of an instrument for obtaining air samples is described, and directions for its use are given. Maximum errors in sampling should not exceed 0.95% with a probable error of 0.5%. B.C.R.

Conductivity determination by the guarded hot-plate method. F. C. HOUGHTEN. *Proc. Amer. Soc. Testing Materials*, **42**, 277–84 (1942).—Six laboratories participated in a program using two Bureau of Standards plates 18 in. square, two National Research Council plates 12 in. square, and two Alundum round plates $7^1/_8$ and $9^3/_8$ in. in diameter. Materials tested covered a wide range of conductivity and maximum temperature at which they might be used. Results show that the code proposed is probably more accurate in giving comparable results than the manufacturer's control in manufacturing. W.R.B.

Industrial use of compressed air. ANON. *Ministry of Fuel and Power Bull.*, No. 29; abstracted in *Glass*, **21** [6] 143–47 (1944).—Causes of inefficient operation of compressed-air systems and calculations for determining the size of air mains and pressure loss in pipes are presented. B.C.R.

Mechanical-electrical dust collector. ANON. *Power Plant Eng.*, **48** [12] 90–91 (1944).—Mechanical collectors have proved very efficient for dust over 10μ in size, and electrical collectors are efficient for smaller dusts. All of the dust passes through a mechanical collector, and then 15% of the dusty gas goes through the electrical collector. It is not economically feasible to send more through the electrical collector. The unit collects 90 to 94% of the dust. A graph shows the length of travel of various sized dust particles in a 5-mile wind. W.D.F.

Methods of testing hydrometers. J. P. BADER AND E. L. PEFFER. *Proc. Amer. Soc. Testing Materials*, **42**, 463–72 (1942).—Specific gravity can be determined by any of the following three general methods: (1) weighing at standard temperature in glass pycnometers of known volume, (2) use of hydrostatic balances, such as the Westphal Balance, and (3) instruments of flotation (hydrometers). A convenient means of testing hydrometers in

the laboratory is described. Hydrometers are tested by the method of hydrostatic weighing or by direct comparison with a standard hydrometer. Correct procedures are carefully outlined. W.R.B.

Modern hardness-testing machines. K. MEYER. *Fertigungstechnik*, **1/77**, 232–34 (1943).—M. reviews modern hardness-testing machines, especially machines for determining Brinell and Vickers hardness for solid bodies. Two types of optical measuring devices are in use, microscopes coupled with a measuring device and projector devices with a screen on which a magnified picture of the penetration is shown. This is less fatiguing and does not require focal adjustment during operation. Instruments described include Briviskop and Dia-Testor; photographs and schematic cross sections show their principles. P.G.

More than million periscope prisms produced in 1944. ANON. *Bull. Amer. Ceram. Soc.*, **24** [2] 86 (1945).

New design of horizontal-type foundry oven for baking cores. ANON. *Ind. Heating*, **12** [1] 98, 103–104 (1945).—A new type is described that has four levels of horizontal core travel. The capacity is 50,000 lb. of cores per 8-hr. shift, and the maximum temperature is 650°F., although most of the core baking is done at 450° to 550° F. The heat capacity is 3,000,000 B.t.u. per hr., and the temperature is kept uniform in the oven by a six-point temperature control. M.HA.

New hardness testing instruments. K. MEYER. *Fertigungstechnik*, **1/78**, 17–19, 47–51 (1944).—Descriptions, cross sections, and photographs are given of the radial hardness testing machines Briviskop 130, Briviskop 115, and Briviskop 187.5, manufactured by Reicherter, Esslingen; the latter contains a screen. The Wolpert-Werke in Ludwigshafen also produces a hardness-testing apparatus, the Dia-Testor, with a ground-glass screen. Reicherter also manufactures Brivisor 62.5 and Brivisor 3000, the latter with a built-in microscope. Mohr & Federhaff produces the cone indenter press KE_{m3} and KC_{em3}, Brinell press KC_eS_{m3}, and hardness-testing machine KRV 0.25. The apparatus described are the latest in the field of hardness testing. P.G.

Principles of comminution—size and surface distribution. A. M. GAUDIN AND R. T. HUKKI. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1779; *Mining Tech.*, **8** [6] 17 pp. (1944).—The surface on the fragments is distributed in definite and simple relation to size. Experimental work included (1) surface measurement of fragments by ethane adsorption, (2) refinement of the measurement of particle size, and (3) development of a crusher for crushing small amounts, in which two oppositely swinging pendulums were used. The paper contains an abundance of mathematical and experimental detail. W.D.F.

Radiant gas burners in the modern oven. CARL P. MANN. *Products Finishing*, **9** [2] 28–42 (Nov., 1944).—The application of the ceramic gas radiant burner to the drying of various finishes is discussed in detail. A diagram is given of the radial distribution of radiant heat in front of three typical incandescent ceramic-cup gas burners operating in open space. This indicates the spread of the heat from the burner. The application of this type of heat to the heating of strip is illustrated by two figures. Application of the burners to material carried on a conveyer is shown. Advantages and disadvantages of this type of heating are as follows: (1) Radiant heat sources can be readily located to provide uniform distribution over the whole area of the workpieces. (2) As compared with convection ovens, radiant ovens are not so adaptable to processing a variety of different kinds and shapes of workpieces. In designing electrical infrared-lamp ovens, attempts have been made to overcome this handicap by arranging the lamps on flexible mounts which can be changed to suit several different shapes of workpieces, but such changes involve additional labor as well as loss of time and materials in experimenting to determine the proper position of the lamps for the various pieces. Every proposed oven installation, however, is an individual problem and should receive individual analysis, because only in this way can the most efficient use be made of that powerful but yet misunderstood radiant heat. H.K.R.

Sedimentation analysis. Improved manometric method. F. R. JONES AND C. G. BARLOW. *Jour. Soc. Chem. Ind.* [London], **62** [9] 129–32 (1943).—An apparatus for sedimentation analysis is described that avoids the need for a long manometer for measuring the slight change of pressure caused by the subsidence of solid particles in a liquid medium. It is designed so that the pressure that will be exerted by the column of homogeneous dispersion can be calculated and, by adjusting the instrument accordingly, a condition of equilibrium will exist at the commencement of sedimentation. The first reliable value of the change of pressure is obtained within 20 sec. The weight sedimented/time curve for the first few minutes (while the larger particles are settling) can thus be constructed from experimental data without resorting to extrapolation. Duplicate analyses can be made without refilling the sedimentation tube.

Sodium bentonite used for clearing turbid water. ANON. *Science News Letter*, **46** [21] 323 (1944).—U. S. Pat. 2,362,022 describes a new process for clearing water of silt by the use of sodium bentonite, an exceedingly fine-particled clay that has the property of swelling immensely when wet. G.A.K.

Spray painting pointers for industrial engineers. JAMES A. BEDE. *Products Finishing*, **8** [11] 58–64 (Aug., 1944).—The factors for obtaining balanced atomization are listed as follows: (1) use of the correct air cap and fluid nozzle, (2) use of correct type solvent, (3) viscosity of material, (4) rate of material flow (pressure system 10 to 12 gal. per hr.), (5) air pressure (with correct fan adjustment), (6) distance gun is stroked from workpiece (average 8 to 10 in.), and (7) speed of gun stroke (average 200 ft. per min.). These items are discussed. 4 illustrations. H.K.R.

Two spot plates in one. ANON. *Laboratory*, **15** [2] 31 (1944).—The Harlequin spot plate has half of the background black and half white, and color observations can be made against either background. Determinations can be made that are difficult with just one background. The plate is of glass with three numbered cavities and has bands of black and white enamel frit on the bottom. W.D.F.

Use of infrared in drying pottery. R. E. GOULD, B. B. EVANS, AND A. M. FLANNIGAN. *Bull. Amer. Ceram. Soc.*, **24** [2] 62–65 (1945).—8 figures.

SEPARATE PUBLICATIONS

Diatomites of the Pacific Northwest as Filter Aids. KENNETH G. SKINNER, ARTHUR A. DAMMANN, ROY E. SWIFT, GEORGE B. EYERLY, AND GORDON R. SHUCK, JR. *U. S. Bur. Mines Bull.*, No. 460, 87 pp. (1944). Price 25¢ from Supt. of Documents, Washington, D. C.—The authors describe experiments by the Bureau of Mines in cooperation with the University of Washington in testing Pacific Northwest diatomites for use as filter aids in refining sugar and other products. Diatomites from Washington, Oregon, northern California, and Idaho were examined. Calcination increased the efficiency of the samples, but none proved as good as commercially used diatomites that had undergone special processing. The conclusion of the research workers is that "each diatomite to be used as a filter aid should be tested to find the best size and the best calcination conditions to give a product having the required filter-aid characteristics." See *Ceram. Abs.*, **24** [1] 20 (1945). R.A.H.

Midget Microprojector for Dust Determinations. CARLTON E. BROWN. *U. S. Bur. Mines Rept. Investigations*, No. 3780, 14 pp. (1944). Free.—B. describes the construction and application of a small microprojector that is easy to use in making determinations of dust in atmosphere. R.A.H.

X-Ray Diffraction. ANON. Published by North American Philips Co., Inc., 100 East 42d St., New York, N. Y., 1945. Reviewed in *Bull. Amer. Ceram. Soc.*, **24** [2] 55 (1945).

PATENTS

Attrition mill and method. ISIDOR CHESLER (Eagle Pencil Co., Inc.). Can. 423,119, Oct. 10, 1944 (Jan. 10, 1941; in U. S. Jan. 15, 1940). G.M.H.

Resistance element for pyrometers. ALLMANNA SVENSKA ELEKTRISKA AKTIEBOLAGET. Brit. 566,448, Jan. 10, 1945 (Aug. 21, 1942).

Saw band for hard refractory materials. W. T. ANDERSON (Contour Saws, Inc.). U. S. 2,368,092, Jan. 30, 1945 (Dec. 30, 1943). 18 claims. (Cl. 125-21).

Kilns, Furnaces, Fuels, and Combustion

Coal research and kiln firing. ANON. *Claycraft*, **18** [3] 103–104 (1944).—The three elements which enter into all furnace firing are (1) combustion, including the amount of heat released and the speed and completeness of reactions both in the fuel bed and with secondary air in the flames, (2) heat transfer and thermal balances or transfer of heat from flame to ware as economically as possible, and (3) the aerodynamics of hot gases, laws governing the total amount of air and gas drawn through the system and the way in which the gases distribute themselves through the charge. Much research on combustion has been carried out in recent years. One hypothesis is that the mechanism of burning of fuel is not a simple two-zone process, CO_2 followed by reduction to CO; rather the air reacts on the fuel surfaces to give CO, which in its turn burns in the voids between the particles to give CO_2 and is then partially re-reduced to CO in the subsequent layers of the bed. This opens up a possibility of designing a clinker-free gas producer by avoiding the combustion of the initial CO and thus preventing high temperatures. G.A.K.

Design and operation of tunnel kilns. MARSHALL T. CHURCH. *Brick & Clay Record*, **106** [1] 34–35, 44 (1945).—Improvements in the design of tunnel kilns in recent years have made possible the shorter length kilns. In general, circular kilns are not practical for heavy clay products, primarily because they have to be loaded and unloaded continuously. The closed-bottom straight-tunnel kiln appears more suitable for heavy clay products than the open-bottom type because of lower construction costs; the trucks run cooler because the amount of cooling air may be controlled, whereas only natural circulation is provided with the open-bottom type. Operation of the car-moving mechanism and fan equipment is discussed. The use of two smaller kilns is preferred to one large kiln, since in slack times one kiln can be operated at 100% capacity instead of running the large kiln at 50%. Installation costs would be increased about 10% by constructing two kilns. B.C.R.

Firing pottery. ANON. *Elec. Rev.*, **132**, 375–76 (1943); abstracted in *Nickel Bull.*, **16** [5] 71 (1943); *Science Abs.–B*, **46**, Abs. No. 1359 (June, 1943).—A high-temperature continuous electric tunnel kiln is in operation at the Worcester Royal Porcelain Co., Ltd., England, for glost firing at 1140°C. (2085°F.) The kiln is 100 ft. long, and the load passing through is from 700 to 800 lb. per hr. The 96 heating elements are of nickel-chromium heavy-duty tape, arranged in zigzag fashion along the sides of the kiln in tiers of four. Each can carry 3 kw. and supports its own weight. Each element is in a firebrick tray or drawer, which can be removed for outside replacement. The zones are far preheating, near preheating, and firing zone. The kiln is automatically regulated. Any arrangement of elements may be made. L.R.B. & H.K.R.

Fuel efficiency in industry. H. W. BRIGHTEN. *Fuel Econ. Rev.*, **23**, 29–36 (1944).—B. describes methods of economizing in the use of fuel. The essential cooperation between management, technical staff, and production superintendents is stressed. The functions of fuel officers are outlined. Some modern methods and types of heat-utilization equipment are briefly discussed. 7 figures. E.R.V.

Heat of formation of carbon dioxide and of the transition of graphite into diamond. EDWARD J. PROSEN, RALPH S. JESSUP, AND FREDERICK D. ROSSINI. *Jour. Research Nat. Bur. Standards*, **33** [6] 447–49 (1944); RP 1620. Price 5¢ from Supt. of Documents, Washington, D. C. R.A.H.

Principles and practice of lithium heat-treating atmospheres: I–III. CHARLES E. THOMAS. *Ind. Heating*, **11** [9] 1405–16; [11] 1810–18 (1944); **12** [1] 42–46 (1945).—The search for a neutral and noncritical atmosphere in furnaces for the heat-treatment of steel led to the use of lithium which, when introduced into ordinary combustion gases, nullifies completely the destructive action of oxygen, carbon dioxide, hydrogen, sulfur, and water vapor. It dissociates water vapor in the furnace chamber and combines with oxygen so that the steel under treatment is not affected; it maintains a completely dry, oxygen-free atmosphere in the furnace chamber, which is the essence of the problem of good heat-treating. As lithium, as a metal, is volatile at 700°F. and its oxide (Li_2O) is a vapor at 900°F., it is easily introduced with the gas atmosphere into the furnace chamber where it is maintained in the vapor state at much higher temperatures. The principal reactions occurring are $2Li + H_2O = Li_2O + H_2$ and $4Li + O_2 = 2Li_2O$. In the process, all of the lithium is recovered again and undergoes the cycle of reactions continually. The various steps connected with the use of lithium for the prevention of scaling and decarburization, the means of introducing Li into the furnace, and the reactions are described in full. The richest lithium ores are found in the Black Hills of South Dakota in the form of spodumene crystals which sometimes are 30 to 40 ft. long and weigh over 50,000 lb. Its salts are present in sea water and in the soil. M.HA.

Underground gasification of coal—considerations of available information. E. T. WILKINS. *Fuel Econ. Rev.*, **23**, 14–18 (1944).—W. reviews the origin and development of the idea and of modern methods used in Russia and the possibility of applying the practice in British coal fields. Of the two most attractive methods of underground gasification, one appears to be applicable only to steeply dipping seams, and the other requires coal properties not found in all British coals. The methods so far tried in Russia may not be suitable for application to coal seams now being mined by conventional methods, but it may be that they can be applied to certain seams which now present difficulty in working. This conclusion conforms to the Russian precedent, for in that country experiments appear to have been confined to seams which present some difficulty in mining for various reasons, including (1) thinness of seam, (2) excessive angle of dip, (3) underground fire hazard, and (4) high ash content of coal. There are known difficulties in operation, such as that of maintaining a regular supply of gas, and information on a number of points is lacking. Until more information is available, the potentialities of the process in the United Kingdom cannot be accurately assessed. 24 references, 2 figures. E.R.V.

SEPARATE PUBLICATIONS

Analyses of Kentucky Coals. ANON. *U. S. Bur. Mines Tech. Paper*, No. 652, 323 pp. (1944). Price 40¢ from Supt. of Documents, Washington, D. C.—Principal facts are presented regarding the occurrence, reserves, quality, characteristics, production, and uses of Kentucky coals. R.A.H.

Carbonizing Properties of Pocahontas No. 3-Bed Coal from Kimball, McDowell County, W. Va., and the Effect of Blending This Coal with Pittsburgh-Bed Coal. J. D. DAVIS, D. A. REYNOLDS, W. H. ODE, AND C. R. HOLMES. *U. S. Bur. Mines Tech. Paper*, No. 670, 35 pp. (1944). Price 10¢ from Supt. of Documents, Washington, D. C. R.A.H.

PATENTS

Combination burner for liquid and gaseous fuels. A. J. TURPIN (Hauck Manufacturing Co.). U. S. 2,368,178, Jan. 30, 1945 (Jan. 26, 1943). 3 claims. (Cl. 158-11).

Improvement of the combustion properties of lean coals, semicoke, and other coals of low quality. C. BOISSEAU. Fr. 874,984; *Chem. Zentr.*, **1943, I** [6] 699–700.—A mixture of MnO_2, Na_2CO_3 ($^1/_3$ each), and K_2NO_3 and powdered charcoal ($^1/_6$ each) is added with eventually another addition of 1 to 2% fluorspar. M.HA.

Geology

Apparatus for measuring the lateral pressure of clay samples under a vertical load. G. M. BINNIE AND J. A. PRICE. *Jour. Inst. Civil Engrs.* [London], **15** [4] 297–306; **16** [8] 486–99 (1941); *Bldg. Science Abs.*, **15** [3] 42 (1942).—A description of the apparatus with drawings and graphs showing experimental results and notes on tests of clay and details of consolidation are given. A discussion is included.

Bureau seeks strontium from domestic ores. M. M. FINE AND R. G. O'MEARA. *Eng. Mining Jour.*, **145** [12] 93–95 (1944).—Deposits in Texas in Brown, Nolan, Fisher, and Coke Counties were studied. There are reserves of 271,000 tons of 73% strontium sulfate, mainly in Brown County. These are limestone replacement deposits, the chief impurities being clay and calcite. The grade required was 90 to 92% strontium sulfate. The ore was ground to 20-mesh and then classified and tabled. The table concentrate and middling were floated; two different runs gave 92.5 and 93.5% strontium sulfate in the concentrate. W.D.F.

Chromite deposits of the Eastern Townships, Quebec. ANON. *Bull. Imperial Inst.*, **42** [2] 109–12 (1944).—Canadian output of high-grade chrome ore and concentrates for 1943 reached a new record of 30,085 short tons. This amount falls short of domestic requirements. In southeastern Quebec, an irregular belt of serpentine extends for a distance of 470 miles from the Gaspé Peninsula to the Vermont boundary, and chromite deposits occur mostly in the southwest end of this belt. G.A.K.

Chromite deposits of Turkey. FALIH ERGUNLAP. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1746; *Mining Tech.*, **8** [5] 11 pp. (1944).—Turkey produces the highest grade chromite (52% Cr_2O_3) in the world and in some years produces 200,000 tons per year. The deposits are related to intrusions of ophiolite rock and are found in three geologic provinces. Their age is early Paleozoic to Cretaceous. Types of ore that may be recognized are sprinkled, banded, spherical, spotted, and massive. Some of the deposits have been metamorphosed. W.D.F.

Dead Sea as a source of potassium salts. E. BERGMANN. *Advancement of Science*, **2** [7] 225–28 (Oct., 1942); abstracted in *Jour. Soc. Glass Tech.*, **27** [119] 5 (1943).—Since 1930 the Dead Sea has played a modest role in the supply of its three most important constituents, potassium salts, bromine, and, to a very small extent, magnesium salts. With the outbreak of war, its importance has grown considerably, as the main previous production centers of these three vital materials are now in Axis hands—potassium salts to an extent of 85.2% of the world production, magnesium to 66%, and bromine to about 50%. The Dead Sea is now the only source of these commodities in concentrated form within the British Empire. The quantities of salts in the Dead Sea are estimated to be as follows:

	10^9 Tons
Potassium chloride	2.0
Sodium chloride	11.9
Calcium chloride	6.0
Magnesium chloride	22.0
Magnesium bromide	0.98

According to the last published report (1938) of the Palestine Potash Co., 63,527 tons of potassium chloride have been manufactured.

Differentiation of hydrogen clays and identification of their mineral constituents by electrochemical and viscous methods. J. N. MUKHERJEE AND R. P. MITRA. *Nature*, **154** [3922] 824 (1944).—Hydrogen kaolinites from four different samples of kaolin and a number of hydrogen clays known to contain kaolinitic minerals have a dibasic acid character within the range of pH 4 to 11.0. The first inflection usually occurs between pH 7.0 and 8.0, and the second between pH 8.0 and 9.5. Hydrogen clays containing only montmorillonitic minerals show only one inflection between pH 7.1 and 8.8 when titrated with caustic soda and between pH 5.2 and 7.5 when titrated with barium hydroxide and calcium hydroxide. Another criterion for differentiating kaolinitic clays from those containing montmorillonitic minerals is based on the effect of the addition of caustic soda on the viscosity of aqueous suspensions of the hydrogen clays. On addition of the alkali to the hydrosols of hydrogen bentonites and montmorillonitic hydrogen clays, their viscosity increases to a point corresponding to about 75% neutralization of the acid given by the inflection point of the titration curve. Apart from a slight initial increase, the alkali has no marked effect on the viscosity of hydrogen kaolinite and hydrogen clays containing only kaolinitic minerals within the range pH 4 to 11. See "Electro. . .," *Ceram. Abs.*, **23** [6] 110 (1944). G.A.K.

Exploration of five western clay deposits. NORMAN L. WIMMLER, H. G. IVERSON, S. H. LORAIN, P. E. OSCARSON, AND S. RICKER. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1739; *Mining Tech.*, **8** [5] 10 pp. (1944).—To find high alumina clays, five deposits at Molalla and Hobart Butte, Ore.; Cowlitz-Castle Rock, Wash.; Ione, Calif.; and Olson-Troy, Idaho, were systematically core drilled; preliminary drilling has been done at 15 other localities. These are Tertiary sedimentary clays, sometimes further altered by weathering, etc. The clays differ in physical properties. The thickness averages from 22 to 100 ft., while the overburden is from 0 to 50 ft. thick. Available Al_2O_3 runs from 22 to 32% and Fe_2O_3 from 2 to 10%. There are 175,000,000 tons of measured clay and 50,000,000 tons of indicated clay. The cost of removing the overburden is estimated at 7 to 9¢ per ton, while the cost of mining the clay is 15 to 20¢ per ton. W.D.F.

Exploration on the Stillwater chromite deposits, Stillwater and Sweetgrass Counties, Montana. PAUL T. ALLSMAN AND E. W. NEWMAN. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1751; *Mining Tech.*, **8** [5] 12 pp. (1944).—Chromite is found in the harzburgite rock. Analysis of a representative sample showed Cr_2O_3 46, FeO 24, Al_2O_3 24, MgO 5, and SiO_2 1%. The chromium-iron ratio ranges from 1.5 to 2.0. Trenching, sampling, and core drilling by the Bureau of Mines have delimited over 5,000,000 tons of chromite ore containing more than 20% Cr_2O_3. The Benbow and Mouat-Sampson mines have been developed and are fully equipped for mining and milling 500 tons and 2000 tons a day, respectively. W.D.F.

Fluorspar in South and South-West Africa. ANON. *Bull. Imperial Inst.*, **42** [2] 118–21 (1944).—Principal deposits of fluorspar are in the Transvaal. Present supplies are largely obtained from veins and pipes in the red granite of the Bushveld igneous complex where there are good reserves. To the end of 1940 about 100,000 short tons had been produced in the Union, and total reserves are estimated at 750,000 tons. Most important deposits in the Marico district of western Transvaal are those on the farm Buffelshoek 284. The fluorspar has partly replaced dolomite, and the unreplaced dolomite has later been leached out, leaving residual manganese earth. The resultant deposit consists of thin alternating layers of granular fluorspar and manganese earth. See *Ceram. Abs.*, **24** [1] 25 (1945). G.A.K.

Froth flotation of some nonsulfide minerals of strategic importance. S. A. FALCONER AND B. D. CRAWFORD. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1754; *Mining Tech.*, **8** [6] 16 pp. (1944).—Scheelite and other tungsten minerals are readily floated; if the ore contains other readily floatable minerals, however, such as calcite, dolomite, fluorite, barite, talc, garnet, or apatite, trouble will be experienced in obtaining a good concentrate unless the kind and amount of flotation reagents are just right. Manganese oxides respond to soap flotation, but the frequent presence of gangue slimes and soluble salts necessitates washing before flotation. Rhodochrosite ores are much easier to float. Chromite ores are usually concentrated by gravity methods, but flotation is sometimes used. When contaminated with garnets, the fast-floating garnet is first floated, followed by the chromite. Titanium-bearing beach sands, a brookite ore, a tin ore, and other ores of fluorite, spodumene, kyanite, garnet, corundum, celestite, and gypsum were all concentrated successfully. W.D.F.

Grain sizes and shapes of various minerals in igneous rocks. MICHAEL W. FENIAK. *Amer. Mineralogist*, **29**, 415–21 (1944).—Conflicting statements are found in geological literature regarding grain sizes of various minerals in igneous rocks. F. has found no general information on the subject. A series of 200 rocks, involving over 40,000 measurements, was studied in thin sections at the University of Minnesota. The average size of the largest mineral, microperthite, was 1.8 x 1.0 mm.; quartz averaged 0.8 x 0.5 mm.; and the smallest mineral, zircon, was 0.06 x 0.04 mm. Results of the study are used to arrive at some general conclusions. The average grain size for a mineral differs in different granitoid rocks. Any one mineral in a series of several hundred granitoid igneous rocks shows an average grain size that differs widely from the average grain size of another mineral in the same series of rocks. Different minerals differ in average shape as well as average area. The characteristic essential and varietal minerals are strikingly larger than the usual accessory minerals. There is a suggestion that this difference may be due largely to the abundance or scarcity of the corresponding material in the parent magma, but data are rather meager for this theory. W.D.F.

Mineralogy of two cobalt occurrences in British Columbia. H. V. WARREN AND R. M. THOMPSON. *Bull. Inst. Mining Met.*, No. 470, pp. 1–16 (1945). E.R.V.

Origin of the Edwin clay, Ione, California. T. F. BATES. *Bull. Geol. Soc. Amer.*, **56** [1] 1–36 (1945).—The Edwin clay, a commercially important deposit near Ione, is of sedimentary origin. It consists of kaolinite with some gibbsite, hematite, authigenic anatase, quartz grains, and a suite of heavy minerals. The clay, quartz, and heavy minerals were derived from Sierra Nevada rocks to the east. The gibbsite and hematite came from laterite that developed upon greenstone to the west. A.C.B.

Pollucite from Karibib, South-West Africa. H. J. NEL. *Amer. Mineralogist*, **29**, 443–52 (1944).—Pollucite, the only cesium silicate known, has been found for the first time in South Africa. It has $n = 1.5173$ (Na light) and the dispersion $n_F - n_C = 0.0083$. A chemical analysis gives the formula $Cs_{10}Na_4Al_{14}Si_{34}O_{96}\cdot 6H_2O$. From a consideration of this and other available analyses, it appears that an isomorphous series exists between pollucite and analcite. This series results from the isomorphous replacement of Cs^+ by Na^+ with the concomitant introduction of a water molecule in the unit cell. The variation of the refractive index within this series is shown graphically. Some dehydration curves show that the water is an essential part of the crystal lattice. W.D.F.

Recovery of cobalt, copper, and gold from an arsenical concentrate by roasting and leaching. F. A. FORWARD AND A. G. LYLE. *Bull. Inst. Mining Met.*, No. 470, pp. 16–18 (1945). E.R.V.

Spokane garnet sand operation. H. W. INGALLS. *Mining Congr. Jour.*, **30** [11] 28–29 (1944).—The garnets are near Fernwood, Benewah County, Idaho. A glacier ground up a garnet-bearing mica schist and deposited it in an old lake. There is about 5 ft. of garnet sand covered with 5 ft. of overburden; the proved reserve is 3,000,000 tons of gravel. The gravel is excavated with a dragline shovel. Primary milling uses jigs and tables, and the secondary has jigs, screens, and driers. The size of the product varies from 6- to 100-mesh. It is used in sandblasts for cleaning castings of different metals. W.D.F.

Tennessee, the Volunteer State. ANON. *Mfrs. Record*, **114** [1] 71–101 (1945).—The State's resources are discussed, including agriculture, manufacturing, forests, and minerals, together with its educational facilities. Tennessee has a great variety of mineral wealth and claims to have at least 55 minerals in sufficient quantities to have industrial significance. Its normal annual production of minerals totals 65 million dollars. It ranks among the first three national producers in the production of aluminum, sulfuric acid, phosphate, zinc ore, ball clays, marble, barite, and manganese. About one third of the State's mineral production value is found in coal. Tennessee is the only southern state that produces copper. Western Tennessee's ceramic clays are among the world's finest, and about 45% of the Nation's output of ball clays is mined there. Other ceramic materials, ground feldspar, flint and kaolin, shales, underclays, etc., are also found in abundance. Limestone, marble, granite, and iron ore are also produced. 1 diagram, 83 photographs. M.R.

Wartime contribution of the American potash industry. J. W. TURRENTINE. *Ind. Eng. Chem.*, **34** [12] 1422–26 (1942); abstracted in *Jour. Soc. Glass Tech.*, **27** [122] 116 (1943).—An analysis of the current situation indicates the adequacy of supplies of potassium compounds for North American requirements. This conclusion is based on the assumption that production will continue without interruption, that deliveries will not be restricted by inadequate transport, and that distribution will be based equitably on the current needs of consumers. This situation is in contrast with that of the last war. In 1939 the results of foresight, research, and industrial development, covering a period of thirty years, reached their culmination when the American potash industry promptly changed over from a peacetime to a wartime basis. Production capacity was expanded, products were diversified, and deliveries were directed where most needed. See "Potash. . .," *Ceram. Abs.*, **22** [11] 202 (1943).

Zircon-rutile beach sands in Australia. ANON. *Bull. Imperial Inst.*, **42** [2] 118 (1944).—Zircon-rutile-ilmenite sands occur along the coast of New South Wales. A 75% natural concentrate was obtained with the production of a final concentrate containing approximately 45% zircon, 25% ilmenite, 25% rutile, and 5% garnet, monazite, etc. G.A.K.

PATENTS

Flocculation of aqueous suspensions and sludges. J. O. SAMUEL (Unifloc Reagents, Ltd.). Can. 423,573, Oct. 31, 1944 (July 4, 1939; in Great Britain July 5, 1938). G.M.H.

Industrial sand-purifying process. A. T. COLE (Minerals Separation North American Corp.). Can. 423,546, Oct. 31, 1944 (April 13, 1943; in U. S. July 17, 1942). G.M.H.

Kyanite concentration. F. X. TARTARON (Minerals Separation North American Corp.). Can. 423,311, Oct. 17, 1944 (Sept. 8, 1941; in U. S. April 9, 1941). G.M.H.

Magnesite-flotation method. A. W. FAHRENWALD (Northwest Magnesite Co.). Can. 424,543, Dec. 19, 1944 (March 12, 1942; in U. S. April 16, 1941). G.M.H.

Method of treating the rock, aplite. R. F. BRENNER (Dominion Minerals, Inc.). U. S. 2,368,194, Jan. 30, 1945 (June 11, 1941). 1 claim. (Cl. 23-110).—The process of treating aplite in lump form to facilitate reduction thereof to the proper particle size suitable for use in ceramic ware with the production of a minimum amount of fines which will pass through a 200-mesh screen during grinding and to facilitate removal of iron, which comprises heating the aplite in lump form at a temperature ranging approximately from 1000° to 2500°F. for a period sufficient to cause the heat to penetrate thoroughly into the lumps

to break down some of the minerals which impart the extreme hardness and the nature of its cleavage thereto, then grinding the lump aplite to the desired particle size suitable for use in ceramic ware, treating the aplite after grinding with an acid to dissolve the soluble iron compounds, and then washing the aplite to remove the iron salts so produced and the excess acid.

Modified clay. B. W. ROWLAND (Edgar Bros. Co.). Can. 423,294, Oct. 17, 1944 (Sept. 21, 1940). G.M.H.

Chemistry and Physics

Analogy of hydrated calcium silicoaluminates and hexacalcium aluminate to hydrated calcium sulfoaluminates. E. P. FLINT AND LANSING S. WELLS. *Jour. Research Nat. Bur. Standards*, **33** [6] 471–78 (1944); RP 471. Price 5¢ from Supt. of Documents, Washington, D. C.—Two calcium silicoaluminates, apparently analogs of the high- and low-sulfate forms of calcium sulfoaluminate, were investigated. The low-silica silicoaluminate has the formula $3CaO \cdot Al_2O_3 \cdot CaSiO_3 \cdot 12H_2O$ and occurs as thin hexagonal plates. In contact with lime solutions it is slowly converted to long needle-like prisms whose habit and optical properties are very similar to those of $3CaO \cdot Al_2O_3 \cdot 3CaSO_4 \cdot 31H_2O$. A hexacalcium aluminate hydrate was prepared that appears to be the analog of the high-sulfate form of calcium sulfoaluminate, in which calcium sulfate is completely replaced by calcium hydroxide. Its formula may be written as $3CaO \cdot Al_2O_3 \cdot 3Ca(OH)_2 \cdot 30H_2O$.

R.A.H.

Benzoin as fluorescent qualitative reagent for zinc. CHARLES E. WHITE AND M. H. NEUSTADT. *Ind. Eng. Chem., Anal. Ed.*, **15** [9] 599–600 (1943).—Benzoin, in the presence of alkali and magnesium ion, reacts with zinc to produce a green fluorescent compound having a spectral range from 4650 to 5700 a.u. The reagent is highly specific for zinc; interference is given only by beryllium, boron, and antimony. While the test is not as sensitive as the one using dithizone, it is pronounced and easy to observe.

F.G.H.

Calcining-behavior tests of dolomite, magnesite, and calcite. VICTOR J. AZBE. *Rock Products*, **47** [9] 68, 70–71, 98, 100–102 (1944).—When applied to lime burning and to the production of hydrate, the calcining behavior of $CaCO_3$ is fairly understood; the dissociation rates and temperatures of magnesite and dolomite are understood to a lesser degree, and, in the case of dolomite, the data generally used is believed to be in error. Tests used in obtaining the dissociation-point data are discussed. Using a CO_2 concentration of 1 atm., the dissociation data of $MgCO_3$ were as follows:

	Initial dissociation (°F.)	Dissociation (°F.) Slow rate	Fast rate
Dolomite	950	1025	1380
Magnesite	860	950	1125

The slow rate adjusted to the proper CO_2 pressure would apply to vertical kilns of long time factor, and the fast rate would apply to rotary kilns. B.C.R.

Determination of boric acid in the presence of acetic acid. S. KÜHNEL-HAGEN. *Z. Anal. Chem.*, **123**, 187–97 (1942); *Chem. Abs.*, **37**, 4031 (1943).—In one sample the sum of the two acids is determined by titration with 0.1 *N* NaOH solution in the presence of mannitol from pH 3 to the color change of phenolphthalein (**I**). In a second sample the approximate concentration of H_3BO_3 is determined by titration from pH 6.7 to the color change of **I**. The difference between the two is approximately equal to the AcOH present. The value found for H_3BO_3 is subjected to two corrections: -1.12% of the calculated percentage of AcOH and $+0.4\%$ of the H_3BO_3 content. All weak acids including NH_4 salts must be absent. Cations which precipitate because of hydrolysis below pH 10 are removed by suitable means. The probable error for a ratio of AcOH:H_3BO_3 of less than 2 is less than 0.2%; for a ratio of less than 10, the error is less than 1%.

Determination of boron. C. KRÜGEL, C. DREYSPRING, AND R. LOTTHAMMER. *Z. Anal. Chem.*, **123**, 15–22 (1941); abstracted in *Brit. Chem. Phys. Abs.–AI*, **1942**, Dec., 408; *Jour. Soc. Glass Tech.*, **28** [126] 74 (1944).—A procedure (involving extraction with H_2O, distillation of the Me_3BO_3, and titration with NaOH (naphtholphthalein) in the presence of mannitol) for the determination of H_2O solution is described. For amounts of $B_2O_3 < 70$ μg., the colorimetric determination using quinalizarin replaces titration.

Determination of iron in aluminate solutions by a polarographic method. N. A. SUVOROVSKAYA. *Zhur. Priklad. Khim.*, **17** [3] 156–58 (1944).—The possibility of using the polarographic method of analysis for the determination of iron in aluminate solutions is proved. This method can be applied for checking the express colorimetric method of iron determination, which has been worked out by the central laboratory of the Ural aluminum works.

Determination of phosphoric acid by potentiometric titration. D. V. VASIL'EV. *Zhur. Priklad. Khim.*, **14**, 689–94 (1941); *Chem. Abs.*, **36**, 3454 (1942).—The method is based upon the reduction of phosphomolybdic blue by $SnCl_2$. The sample to be analyzed, in H_2O or citric acid solution, is treated with a definite volume of Arrhenius' solution (25 gm. NH_4 molybdate, 125 cc. concentrated H_2SO_4, and 875 cc. H_2O); a small aliquot of the solution is taken and titrated electrometrically, by means of a Pt-calomel electrode combination, with a solution of $SnCl_2$. The end point occurs when all Mo is reduced to Mo^V. Numerous fertilizers analyzed by this procedure showed close agreement with conventional methods.

Increase in the acidity of boric acid by the addition of neutral salt. New method for the titrimetric determination of boric acid. HARALD SCHÄFER AND ADOLF SIEVERTS. *Z. Anorg. Allgem. Chem.*, **246**, 149–57 (1941); *Chem. Abs.*, **36**, 3454 (1942).—Potentiometric measurements show that the ionization constant of H_3BO_3 is greatly affected by the presence of Li, Ba, Sr, and especially Ca ions. In a solution which is 5.4 *N* in $CaCl_2$, the apparent pK is reduced to about 4. To titrate H_3BO_3 as a monobasic acid, first neutralize to dimethyl yellow. Then make 3.3 to 3.6 *N* in $CaCl_2$ and titrate to a pH 7 end point. The result can be checked by titrating with NaOH back to the dimethyl yellow end point.

Investigation of ceramic materials by optical and X-ray analysis. E. ROSENTHAL. *Electronic Eng.*, **15**, 320–23 (1943); abstracted in *Jour. Soc. Glass Tech.*, **27** [121] 101 (1943).—The optical method shows whether the material consists of a mixture of crystals or colloidal or glassy substances and also the shape and size of the crystals. The X-ray method of analysis makes possible the identification of the crystals. The underlying principles of X-ray analysis are explained, and the technique and use of X rays and photomicrographs are described and illustrated.

Kaolinite structure of amesite, $(OH)_8(Mg,Fe)_4Al_2(Si_2Al_2)O_{10}$, and additional data on chlorites. JOHN W GRUNER. *Amer. Mineralogist*, **29**, 422–30 (1944).—An nvestigation of amesite with X rays discloses that the mineral cannot be a simple chlorite. It has essentially a kaolinite structure, with one chlorite layer placed every 10 to 16 kaolinite layers. As chlorites increase in Al at the expense of Si, there is a shrinkage normal to the basal cleavage. Reasons for this decrease as well as for the instability of the chlorite structure when the ratio of trivalent ions to Si reaches a certain value are suggested.

W.D.F.

Microcolorimetric determination of vanadium in rock minerals and ores with benzidine. I. P. ALIMARIN. *Zhur. Priklad. Khim.*, **17** [1–2] 83–93 (1944).—A highly sensitive reaction of benzidine oxidation in 10% phos-

phoric acid has been worked out, in consequence of which an intense yellow color is developed, permitting the determination of vanadium in a dilution of 1:5,000,000. It is recommended for the colorimetric microdetermination and semimicrodetermination of vanadium in minerals and ores. The effect of the presence of chromates and manganates was eliminated by reduction with Mohr's salt and sodium nitrite. Decomposition of ores and minerals was performed with phosphoric acid and with a mixture of phosphoric and fluoric acids. The method permits detection of 0.5 to 0.02% V_2O_5 within 1.5 to 2 hr. in specimens weighing 5 to 30 mg.

New definition of hardness. M. I. Koĭfman. *Compt. Rend. Acad. Sci. U.R.S.S.*, **30**, 830–31 (1941); abstracted in *Chem. Zentr.*, **1943, I** [6] 604.—K. defines hardness as a resistance of the surface layers of a body to local injuries under the effect of mechanical forces concentrated in a restricted area of the body. This new definition establishes a difference between hardness and mechanical strength. While the latter characterizes the resistance of the whole body to complete destruction or general deformation under the effect of exterior mechanical forces, hardness should be considered only as the resistance of the surface layers of a body against local forces that are not large enough for complete fracture but only for local injuries in a certain area. Hardness is a complex conception and can be both static and dynamic; it characterizes the resistance to normal or combined normal-tangential stresses. M.Ha.

Preparing refractory oxides, silicates, and ceramic materials for analysis by heating with acids in sealed tubes at elevated temperatures. Edward Wichers, William G. Schlecht, and Charles L. Gordon. *Jour. Research Nat. Bur. Standards*, **33** [6] 451–56 (1944); RP 1621. Price 5¢ from Supt. of Documents, Washington, D. C.—The authors describe the preparation for analysis of a number of refractory oxides, ceramic materials, and minerals by decomposition with hydrochloric or hydriodic acid at temperatures up to 300°C. All the oxides of the elements in the second, third, and fourth groups of the periodic system, with the exception of silica, titania, zirconia, and possibly hafnia, respond to the treatment. Several silicate minerals, ordinarily difficult to prepare for analysis, are likewise successfully decomposed. R.A.H.

Spectrochemical methods of analysis for ores and metallurgical products. Paul Giesecke. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1740; *Mining Tech.*, **8** [5] 15 pp. (1944).—G. gives one or more spectrophotometer methods for Cu, Ni, Fe, Mn, V, Mo, P, and Pr. W.D.F.

Study of combined solubility of lithium carbonate with sodium and potassium carbonates in water. G. G. Urazov and Z. I. Lifatova. *Zhur. Priklad. Khim.*, **17** [1–2] 16–21 (1944).—Solubility isotherms of Li_2CO_3–Na_2CO_3–H_2O and Li_2CO_3–K_2CO_3–H_2O systems were first studied at 25°C., whereby the method of determination of solid phases composition according to the method of stability has been applied. In lithium salts manufacture, precipitation of lithium from solution with both potassium and sodium carbonate might be recommended.

Study of the phenomenon of fluorescence. G. A. Golson. *Mines Mag.*, **32**, 110–14, 159–61, 168, 224–26 (1942); abstracted in *Jour. Soc. Glass Tech.*, **27** [122] 114 (1943).—Part I, on the nature of the phenomenon, briefly covers the history, types, and physical theory of fluorescence. Part II deals with the technique of the examination of minerals under fluorescent lighting and describes the sources of the ultraviolet light and associated filters which were used. Part III is devoted to applications in mining and metallurgy, as in the mining of tungsten, zinc, and other metals, but also includes a brief review of applications in other industries. A list of some of the more important industrial minerals, with the color of fluorescence in each case, is given.

System magnesium oxide–boric oxide. H. M. Davis and M. A. Knight. Presented at meeting of American Ceramic Society, April, 1943, Pittsburgh; abstracted in *Ind. Heating*, **11** [4] 622 (1944). M.Ha.

Titrimetric determination of boric acid: I. Harald Schäfer and Adolf Sieverts. *Z. Anal. Chem.*, **121**, 161–69 (1941); *Chem. Abs.*, **35**, 5062 (1941).—The most satisfactory method for determining H_3BO_3 is the titration with NaOH to about pH 8 after the solution has been neutralized to pH about 5 and the H_3BO_3 fortified by the addition of glycerol, invert sugar, or mannitol. Many cations interfere with the determination. They are precipitated when the solution is neutralized; the precipitates adsorb some H_3BO_3, and sometimes other weak acids are formed by hydrolysis and are titrated with the H_3BO_3. In its usual form, the procedure cannot be used in the presence of Zn, Pb, Al, Fe, and Ni. These elements, however, can be removed satisfactorily by addition of oxine and the excess of reagent precipitated with Mg^{++}. As reagent, dissolve 7.5 gm. oxine in 50 ml. of *N* NaOH and dilute to 200; the solution is 0.25 *N* in the Na salt of oxine. To the neutral or slightly acid solution containing H_3BO_3 at 60° add a slight excess of the oxine reagent. After rotating the mixture, test with bromocresol purple indicator solution to see if the yellow indicator turns blue-violet. It is best not to add the indicator at the start. Heat 5 min. to make sure that the precipitation is complete and after 5 min. add 5 ml. of 2 *N* $MgCl_2$ solution. Filter and wash the precipitate with water at room temperature. Make the filtrate just acid to methyl red, add 0.5 gm. of animal charcoal, and after 5 min. filter again. Boil to remove CO_2, cool, add neutral invert sugar solution, and titrate with carbonate-free 0.1 *N* NaOH to an α-naphtholphthalein end point. About 40 test experiments show that the method is good in the presence of Zn, Pb, Al, Fe, and Ni. **II. [New procedure.]** *Z. Anal. Chem.*, **121**, 170–83 (1941).—The above method is based upon neutralization to about pH 5, activation of the H_3BO_3, and then neutralization to pH 8. In some respects it is better to use the same pH end point for both titrations, and approximately 100 experiments here described show that such a procedure is possible and useful. First expel CO_2 by boiling the slightly acid solution in a volume not exceeding 30 to 40 ml. and containing up to about 70 mg. B_2O_3. Cool, neutralize to methyl red or preferably bromocresol purple, and treat with a suitable quantity of invert-sugar solution. This is prepared conveniently by dissolving 1 kg. sucrose in 650 ml. of hot water, adding 8 ml. *N* HCl, and heating at 80° to 90° for 1 to 2 hr. Neutralize with 0.1 *N* NaOH before using. The B_2O_3 solution must be made about 2 *M* in invert sugar or mannitol, but with the latter it is best not to add it all at the start. Now titrate the B_2O_3 solution with carbonate-free 0.1 *N* NaOH to the same indicator that was used prior to the addition of the sugar. As a rule, 1 drop of 0.1 *N* NaOH at the right end point will change the pH from about 5 to about 7. With mannitol, which is not sufficiently soluble in water, first add a slight excess of this sugar so that a little remains undissolved. Titrate with NaOH until the indicator begins to change color. Then heat until the excess mannitol dissolves, cool carefully with ice, and finish the titration in this supersaturated solution of mannitol. For the evaporation of the B_2O_3 solution to 30 to 40 ml., the solution must be slightly basic or some H_3BO_3 will be lost and the basic solution attacks glass, which is likely to contain B_2O_3. If the solution contains a slight excess of $MgCl_2$, it has been found that 200 ml. of 0.5 *N* NaOH can be evaporated to 40 ml. in a Jena Erlenmeyer flask without the introduction of more than 0.1 mg. of soluble B_2O_3, whereas without the Mg salt as much as 2.5 mg. B_2O_3 is dissolved from the glass. The above procedure is shown to give accurate results in the analysis of solutions containing Zn, Ni, Cd, Co, Mn, NH_4, and small quantities of As_2O_3, P_2O_5, and As_2O_5 salts. Specific directions are given for applying the method to the analysis of Ni electrolytic baths and to the analysis of silicates.

Use of sealed tubes for the preparation of acid solutions of samples for analysis or for small-scale refining: pressures of acids heated above 100°C. Charles L. Gordon, William G. Schlecht, and Edward Wichers. *Jour. Research Nat. Bur. Standards*, **33** [6] 457–70 (1944); RP 1622. Price 5¢ from Supt. of Documents, Washing-

ton, D. C.—Special techniques suitable for the use of sealed tubes in treating refractory materials with hydrochloric and other acid mixtures at elevated temperatures are described. R.A.H.

PATENTS

Fluxing of zirconium sand. F. W. BERK & CO., LTD. Fr. 880,342; *Chem. Zentr.*, **1943, II** [2] 161.—The Zr sand containing 65 to 66% ZrO_2 and 31 to 33% SiO_2 is heated with CaO or $Ca(OH)_2$ to 1200° to 1250°C., preferably by the addition of small amounts of calcium halogen compounds which lower the softening temperature of the formed $ZrO_2 \cdot CaO \cdot SiO_2 \cdot 2CaO$. The powdered reaction product can be dissolved in H_2SO_4; the temperature rises thereby to 210°, and the solution is heated to 250° to 280°. From this, 95 to 96% of the ZrO_2 can be precipitated by water in the form of $ZrO \cdot (SO_4H_2)_2 \cdot 3H_2O$. The residue contains mainly SiO_2 and $CaSO_4$. M.HA.

Multiple base-exchange silicates. C. C. WINDING (Tide Water Associated Oil Co.). U. S. 2,368,510, Jan. 30, 1945 (April 25, 1941). 3 claims. (Cl. 23-110).—1. Method for increasing the adsorbent activity of a magnesium silicate which comprises contacting it with hot calcium chloride solution having an excess of calcium equivalents over equivalents of magnesium of the magnesium silicate whereby to produce an exchange calcium silicate and then contacting the exchange calcium silicate with hot magnesium chloride solution having an excess of magnesium equivalents over equivalents of calcium of the exchange calcium silicate.

Production of calcium chromate. E. A. MACCOLL (Chromium Mining and Smelting Corp.). U. S. 2,368-481, Jan. 30, 1945 (April 2, 1942). 2 claims. (Cl. 23-56).—1. The method of producing anhydrous calcium chromate which comprises forming an aqueous solution comprising calcium nitrate and sodium chromate and heating the resulting solution under pressure to a temperature higher than about 180°C. and under conditions ensuring the crystallization of anhydrous calcium chromate.

Titanium carbide purification. C. C. LAUGHLIN (Titanium Alloy Mfg. Co.). Can. 425,132, Jan. 16, 1945 (Oct. 27, 1942). G.M.H.

Transferring molybdenum from spent catalyst to fresh solid catalytic material. H. T. BROWN (Standard Oil Co.). U. S. 2,367,263, Jan. 16, 1945 (Dec. 26, 1942). 5 claims. (Cl. 252-238).

Zirconium compound purification. EUGENE WAINER (Titanium Alloy Mfg. Co.). Can. 424,870, Jan. 2, 1945 (May 26, 1942). G.M.H.

General

Ceramic industry: now and postwar. REXFORD NEWCOMB, JR. *Bull. Amer. Ceram. Soc.*, **24** [2] 46–55 (1945). See "230. . .," *Ceram. Abs.*, **23** [11] 187 (1944).

Ceramics, yesterday, today, and tomorrow. F. SINGER. *Assn. Czechoslovak Scientists & Technicians* [London] *Communication*, No. 119 (Feb., 1944).—Following a brief descriptive history of pottery divided into three periods, (1) the primitive and empirical period (prior to 1870), (2) the traditional period (1870–1920), and (3) the modern period (last 20 years), S. deals with several important developments in refractory materials due to research: (*a*) Prior to 1920 the Allies were largely dependent on Austrian and Slovakian magnesite for magnesia brick. This will never occur in the future, as magnesia is now made from sea water. (*b*) Dolomite brick are now made water resisting and are invaluable in steelmaking furnaces. (*c*) Olivine and forsterite products are gaining increasing importance as refractories. (*d*) Heat-insulating refractories have been greatly improved. (*e*) Brick made of fused refractory material are being increasingly used. (*f*) The dielectric constant of porcelain has been increased from 5 to 10,000. (*g*) Porcelains with one-fortieth the coefficient of expansion of those made 20 years ago are now available. (*h*) Special ceramic bodies with a heat conductivity about 16 times that of bodies made 20 years ago are now available and approach the conductivity of metals. (*i*) Twenty years ago a precision of 0.1 mm. in ceramic materials was exceptional; a much greater precision is now obtained by grinding the finished articles with abrasive wheels impregnated with diamonds. S. considers that unbreakable porcelain is in sight. He pleads for more research and more planning, particularly with a view to mass production, and states that machines are in use which can make 3000 small insulators per min.; one machine can make 1200 cereal bowls per hour, and automatic jiggering systems are in operation producing 200,000 pieces of dinnerware per day. The firing cycle of many articles has been reduced from days to hours. He recommends that future research, planning, and production should be based on the slogan, "Live and *help* live." A.B.S.

Control of industrial atmospheres—dusts, fumes, mists, vapors, and gases. W. N. WITHERIDGE. *Heating, Piping and Air Conditioning*, **16** [12] 712–17 (1944).—W. discusses the problems encountered by the heating and ventilating engineer in the control of industrial atmospheres. Twenty-two common causes of failure are listed. It is pointed out that the basis of ventilation standards and the methods to be used in determining whether an installation complies with given requirements should be fully investigated before guarantees of perfomance are given. M.R.

Dust-exhauster nozzles on grinding machines. H. A. KOOP. *Z. Ver. Deut. Ing.*, **88** [1/2] 21–24 (1944).—The dust originating on grinding machines must be carried away soon and efficiently so that it will not become a health hazard to the operators or injure the machine. A research was made of the shape of nozzles and the velocity conditions of air before them, and a curve was established for the predetermination of air velocities in front of nozzles. The correct position of the nozzle with respect to the source of dust is a prerequisite for efficient operation; the nozzle must be adjustable in at least two directions. Examples show how unsatisfactorily working nozzles could be improved by better location. M.HA.

Institute of Ceramic Engineers. ANON. *Bull. Amer. Ceram. Soc.*, **24** [2] 66–69 (1945).

Microchemical determination of free and combined silica in mine dust. S. R. RABSON. *Jour. Chem. Met. Mining Soc. S. Africa*, **45**, 43–49 (1944).—R. describes a technique worked out for the chemical estimation of free and combined silica in small samples of dust. Previous methods published to determine this very difficult ratio are considered, and the procedure is then given in detail. Again it is a micromethod involving microbalances and the estimation of the silica dissolved by a colorimetric method. The basis of the method is the potassium pyrosulfate fusion. The solubility of finely divided quartz is taken into account. The procedure for rocks has also been worked out, and a table is given of the amounts of quartz dissolved in consecutive treatments with 1% caustic soda for 5 min. at 90°C. The method was further tried out on known mixtures of quartz and kaolin, both being analyzed, and the silica content of the kaolin was almost completely assumed to be combined. Some results are as follows:

Silica present (%)		Silica found (%)	
Free	Combined	Free	Combined
(0.4)	45.0	(0.4)	43.5
22.4	35.0	21.6	32.9
46.2	24.2	44.4	24.0
52.0	21.6	51.2	20.2
69.2	14.0	68.2	13.6
99.4	(0.2)	97.8	(0.9)

The "mineral" analysis by weight is then given of a mine dust. The data given admittedly are for the Witwaters-

rand banket but with modifications may prove of more widespread application. Undoubtedly this is a very valuable contribution to the study of mineral dusts. R. might again have correlated petrographic studies with the results obtained by pure chemical methods. V.L.B.

Microtechnique for the size determination of the size analysis of mine dust. S. R. RABSON. *Jour. Chem. Met. Mining Soc. S. Africa*, **45**, 34–43 (1944).—R. describes a method for the mass size analysis of small quantities of mine dusts. Particles greater than 50μ are removed by a microscreen of 325-mesh phosphor bronze screening, and the subsieve sizing is then carried out in a small sedimentation tube in a 5% alcohol-water solution. R. does not state how complete dispersion is obtained, but the photomicrographs clearly show the accuracy of the method. The weight of dust should be between 5 and 20 mg. The size fractions obtained are over 50, 50 to 20, 20 to 10, 10 to 5, 5 to 2, and under 2μ. Some comparison figures with thermal precipitator records are given, and the fact is noted that the 50μ material is not recorded in the latter method. Valuable additions to the paper might have been the estimation of thickness of the particles by means of the birefringence and also a comparison with micrometric methods of size analysis using a grain size measuring eyepiece and integrating stage. Discussions are included. The paper is a valuable contribution and would be more so if R. had taken into consideration the very serious errors incurred in taking such small samples.

V.L.B.

Pneumoconiosis of coal workers. Thirteenth report of the Coal Dust Research Committee of the Monmouthshire and South Wales Coal Owners Assn. ANON. Condensed in *Colliery Guardian*, **169**, 379–82, 427–32 (1944).—Samples were collected by the konimeter, thermal precipitator, midget impinger, and Soxhlet thimble. The konimeter takes snap samples and is useless because of many major and minor fluctuations in the dust cloud. The Soxhlet thimble is recommended, as it has been found that the velocity in the sampling tube must approximate the velocity in the air way, and this is the only instrument suitable; an improved instrument is described. Different instruments were tried for size analysis, and the Heywood photoextinction sedimentometer is recommended. In this, the dust is suspended in alcohol, and a light beam passes through and hits a photocell; it takes 20 hr. for a run. The South Wales dust meter, a less elaborate turbidimeter, is recommended for routine work. It is standardized against the sedimentometer. Nomograms have been constructed for calculating specific surface and the amount below 5μ. This standard is suggested for the Soxhlet sampler: 0.4 gm. of dust less than 5μ per 1000 cu. ft. of air. W.D.F.

Rowantrees pottery enterprise—a salute to Laura S. Paddock. ANON. *Bull. Amer. Ceram. Soc.*, **24** [2] 43–46 (1945).—7 photographs.

Shaft-sinking operations at Barberton, Ohio, for the Columbia Chemical Division of the Pittsburgh Plate Glass Co. J. MURRAY RIDDELL AND GEORGE A. MORRISON. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1778; *Mining Tech.*, **8** [6] 7 pp. (1944).—Two shafts were sunk for the limestone mine; each was 8 x 17 ft. A temporary headframe was used, with two buckets and hoisting lines in each shaft. There were ventilation and pumps for a small flow of water. The shafts took 364 and 400 days to complete. A mechanical mucking device was invented and used; the saving of time from its use was not as great as it might have been if there had been sufficient hoisting capacity. The hand rate for mucking shale was 37.2 cu. ft. per man per hour active time, while the mechanical rate was 211.7 cu. ft. W.D.F.

Silicates and dusts from the Witwatersrand gold mines. J. J. FRANKEL. *Jour. Chem. Met. Mining Soc. S. Africa*, **44**, 169–77 (1944).—F. describes a number of silicate minerals collected from the gold mines and subjected to careful chemical analysis, microscopic examination, and X-ray diffraction analysis. Few of the specimens were pure enough, as found, for this discriminating examination, and F. evolved special techniques to purify them. Careful analysis photographs, photomicrographs, and X-ray diffraction patterns are given of sericite, pyrophyllite, chlorites, actinolite, epidote, chloritoid, and some clay minerals. The use of the term sericite is open to objection, especially in view of the recent work of Grim, Nagelschmidt, etc., and F. should have introduced the alternates of hydromica or illite so that his work would be more easily correlatable with American and English literature. The green clay mineral aggregate of kaolinite and nontronite has been previously described as faratsihite. F. investigated the quantitative evaluation, by X-ray diffraction methods, of the free and combined silica in dusts. This is one of the most important contributions to the silicate mineralogy of the banket published since R. B. Young's classic work during the last war. It says a great deal for the older work that only very minor improvements have been made on our general knowledge of the banket. Nevertheless the paper is extremely valuable as it affords accurate data for experiments, such as the relative solubility of the minerals and their importance in silicosis. V.L.B.

Silicones open entirely new fields of chemistry. ANON. *Laboratory*, **15** [2] 42–44 (1944).—The silicones are organic compounds with silicon-oxygen chains in them. A stopcock grease has been made from them that is plastic and usable from −40° to 200°C. It preferentially wets glass and ceramic surfaces but can be removed by carbon tetrachloride. See *Ceram. Abs.*, **23** [10] 168; [11] 188 (1944). W.D.F.

Silicosis compensation. ANON. *O. I. C. Monitor*, **18** [1] 10 (1945).—A claimant under the occupational disease act must be totally disabled and must remove himself from exposure to silicon dioxide on the advice of a physician. A change from one foundry to another, even with a change of occupation, did not satisfy these requirements, and the claim was disallowed. C.S.P.

Traits of a good foreman. EDMUND MOTTERSHEAD. *Brick & Clay Record*, **105** [6] 18–19 (1944).—Certain fundamental qualities are essential to successful foremanship. A foreman's rating in these qualities may be determined by an analysis of his job, his characteristics, and his relationships with workers, supervisors, and other foremen. A self-rating personality chart is presented. B.C.R.

SEPARATE PUBLICATIONS

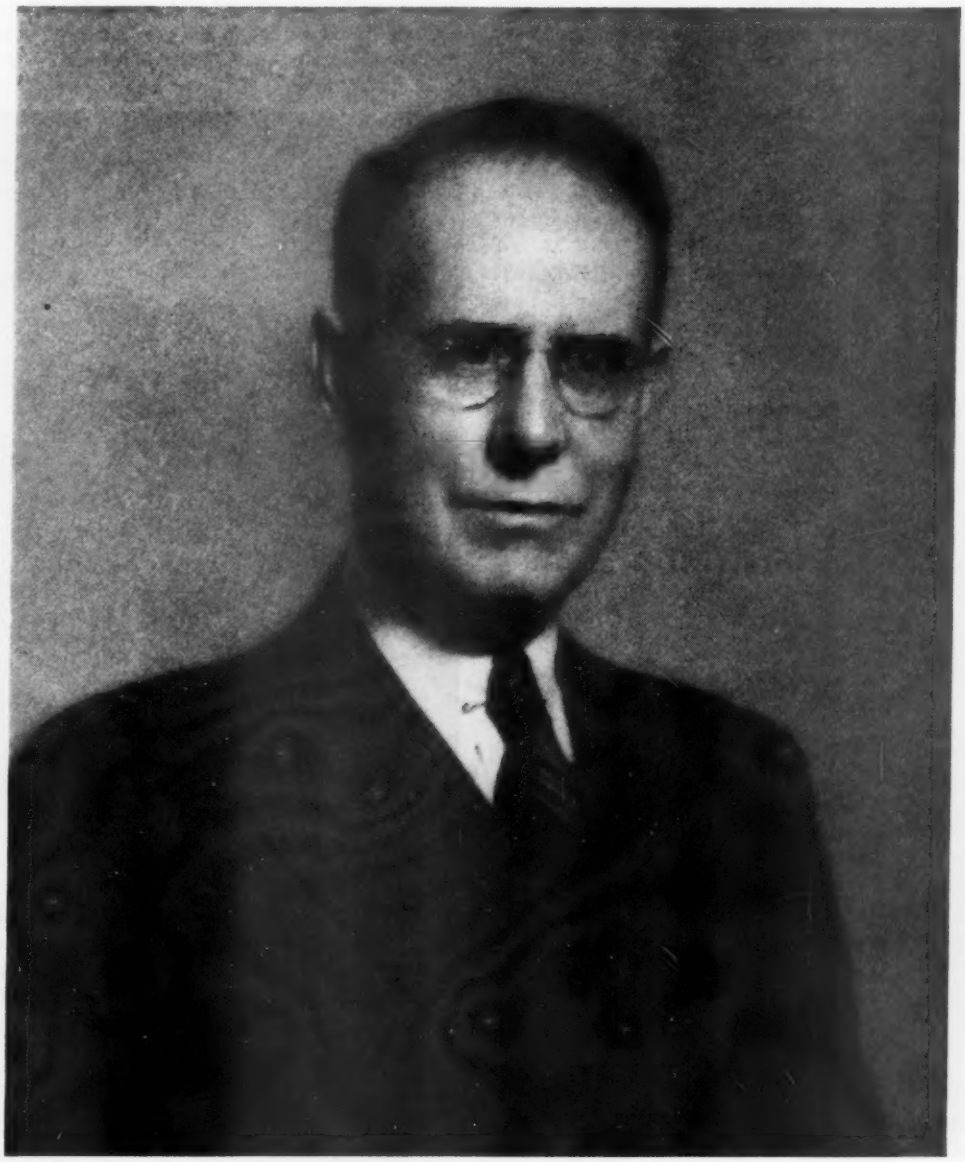
Corning Glass Works. ANON. Published by Corning Glass Works, Corning, N. Y., Nov., 1944; reprinted in *Bull. Amer. Ceram. Soc.*, **24** [2] 85–86 (1945).

Composition and Properties of Molding Sands: I, Nature of the A.F.A. Clay Fraction Removed from Natural Molding Sands. LOUIS H. BERKELHAMER. *U. S. Bur. Mines Rept. Investigations*, No. 3774, 58 pp. (1944). Free.—B. presents a study of more exact nature of what is considered the bond in natural molding sands. The study covered 22 samples of sands in commercial use for both ferrous and nonferrous founding and represented deposits in nine states, Canada, and Scotland. R.A.H.

Control of Silicosis Hazard by Substitution of Quartz-Free or Low-Quartz Material for Sand Under Mine Locomotives. CARLTON E. BROWN AND H. H. SCHRENK. *U. S. Bur. Mines Information Circ.*, No. 7297, 5 pp. (1944). Free.—Because certain sands used to increase the traction of locomotives in some mines contain abrasive silica dust that may lead to silicosis among employees, the use of quartz-free or low-quartz materials for such purposes is suggested. Listed as possible substitutes are granulated slag from blast furnaces and copper furnaces, lava, and cinders, some of which are being tested in mines to ascertain their efficiency. R.A.H.

THE BULLETIN SECTION

Volume 24 March 15, 1945 Number 3



WILLIAM A. HARTY

WILLIAM A. HARTY, PRESIDENT AND GENERAL MANAGER, THE EXOLON COMPANY

Artificial or synthetic abrasives were replacing natural abrasives (Turkish and Naxos emeries and Canadian corundum) to such an alarming extent as early as 1910 that the Alden Speare Sons Company, one of the large importers of Turkish emery, decided to investigate this new field. The Alden Speare Sons Company had been identified with the importation of Turkish emery ore and the operation of mills for crushing and grinding this ore since the early seventies. Both The Carborundum Company and Norton Company were making rapid inroads on the business of those abrasive producers who relied on natural abrasives because the products made from artificial abrasives were more efficient tools and were producible to more exacting specifications.*

Urged by its customers to put itself in position to supply artificial abrasives, the Alden Speare Sons Company in 1912 employed Kalmus, Comstock & Wescott, industrial engineers of Boston, to develop silicon carbide and fused aluminum oxide abrasives. The basic patent on silicon carbide had expired. Fused aluminum oxide abrasive was being produced by the reduction of bauxite by Norton Company and by The Carborundum Company at its French plant by the fusion of nonabrasive Sardis emery ore.

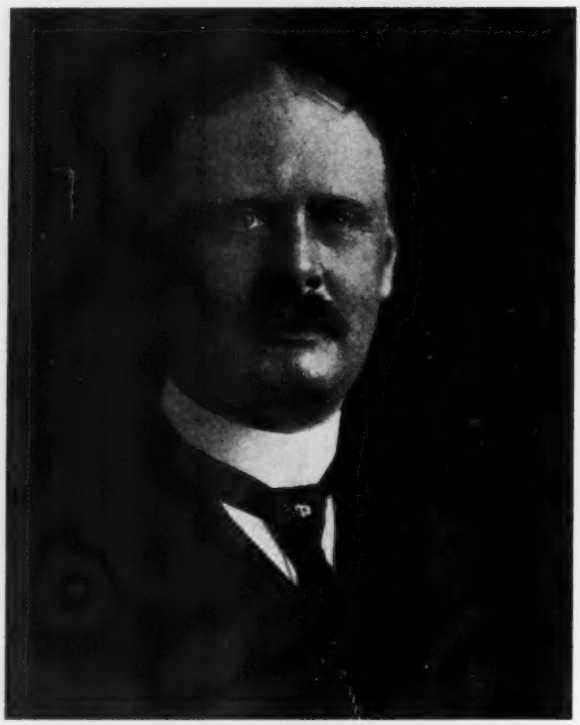
Based on essential patents by Kalmus, Comstock & Wescott, The Exolon Company was organized February 10, 1914, under the laws of Massachusetts for the production of artificial abrasives. The leaders in the formation of the Company were Lewis R. Speare and his brother, E. Ray Speare, who became, respectively, President and Treasurer of the new Company. Herbert T. Kalmus of Kalmus, Comstock & Wescott, was elected Vice-President, and William A. Harty, Clerk† and Assistant Treasurer. These men, together with Allan Hubbard, F. A. Hinchcliffe, Barnebe Campau, and C. Albert Sandt, were the first Board of Directors.

E. Ray Speare originated the name Exolon as the name of the Company and as the trade name for the Company's fused aluminum oxide abrasives. The name Carbolon was the registered trade name for the Company's silicon carbide abrasive.

Thorold, Ontario, Canada, was selected as the site for the furnace plant and it was in operation, producing silicon carbide, by October, 1914. In the spring of 1915, arc furnaces were in operation producing a type of fused aluminum oxide abrasive from nonabrasive Sardis emery ore, to which was added an addition agent under patents granted to Dr. Kalmus.

The crushing plant was located in Blasdell, New York, a small village a few miles south of Buffalo. Both silicon carbide (Carbolon) and fused aluminum oxide (Exolon) were crushed and graded at Blasdell into the sizes required by the wheel manufacturers and the grain trade.

During World War I, when Turkey's participation in the war stopped the supply of Sardis emery ore, Norton Company licensed both The Carborundum Company and The Exolon Company under its patents for the production of fused aluminum oxide. At the war's end in 1918, this arrangement terminated and The Exolon Company discontinued the production of aluminum oxide abrasives, confining its activities to the production of silicon carbide abrasive grain and silicon carbide refractory grain.



Lewis R. Speare

In 1933, after an extended period of research, the Company resumed production of fused aluminum oxide abrasive from bauxite, developing, besides a regular type of Exolon, known as Exolon R, a second type which was of higher purity, known as Exolon F. The latter was more friable than the regular type.

The Company's production facilities have kept pace with the demand for abrasives and refractories, and today the capacity of the Thorold Plant, in both silicon carbide and fused aluminum oxide, is many times the tonnage originally conceived by its founders. The facilities at Blasdell, New York, were necessarily expanded to take care of this growing furnace production.

In August, 1941, a disastrous fire wiped out ninety per cent of the Blasdell Plant just at the time when the demand, due to the war, was at a peak. Two years later

* The Carborundum Company produced silicon carbide under the Acheson patents issued in 1893, and the Norton Company produced fused aluminum oxide abrasive under the Jacobs' patents issued in 1905.

† Under Massachusetts corporation laws, the Secretary has the title of Clerk.

almost to the day, production was started in a fireproof plant erected on the south bank of the Barge Canal in Tonawanda. The site is a thirty-seven acre tract at the extreme edge of the City of Tonawanda on East Niagara Street. This plant, a model of operating efficiency and constructed of brick and steel, covers approximately two and one quarter acres and has adequate siding and shipping facilities.

The success of The Exolon Company is in no small measure due to the active interest of E. Ray Speare, who was elected President in 1916 after the death of Lewis R. Speare. E. Ray Speare retired in the late fall of 1918 and Herbert T. Kalmus became President. A few years later, Mr. Speare returned to active participation in the affairs of the Company as Chairman of the Board and has continued in that position.

The one man, however, who has been most responsible for the growth of The Exolon Company and who has been the spark in the organization from its inception is William A. Harty.

William A. Harty as a young man started his career in the abrasive field in 1902 with the Ashland Emery & Corundum Company, a consolidation of emery mills organized in 1901 and headed by Lewis R. Speare.

Through the ensuing years, participating as he did in every branch of the Company's activities—manufacturing, financial, and selling—he acquired a broad and intimate knowledge of the abrasive grain business in all its phases.

In 1916, when E. Ray Speare was elected President, William A. Harty was elected Treasurer, and in 1919 was made Vice-President and General Manager. Mr. Harty took over active supervision of the plants at Blasdell and Thorold, making his residence in Buffalo. In 1922, he was made President and General Manager, in which position he has continued.

Until 1922, the research and development work was done by Kalmus, Comstock & Wescott, but since that time research and development work has been conducted by the Company.

Mr. Harty, besides having well-rounded financial experience, has always been interested in the technical development of the products of the Company. This interest and his inventive talent have led to several researches and developments originated by him which resulted in patents being granted.

William A. Harty has the happy faculty of inspiring confidence in those with whom he comes in contact and he has drawn around him, over the years, keymen who worked wholeheartedly with and for him. Clarence Brockbank, now an Abrasive Consultant and Comptroller of Abrasives for Great Britain, was one of the men active in the early development of both silicon carbide and aluminum oxide abrasives, and H. E. Schabacker, now a partner in the Erie Enamelling Company, was with the Company in the early twenties, in charge of silicon carbide furnace operations.

Russell Wilcox, who was associated with Dr. Kalmus in some of the early investigations, joined the Company in October, 1914, as chemist. He is Works Manager at Thorold.

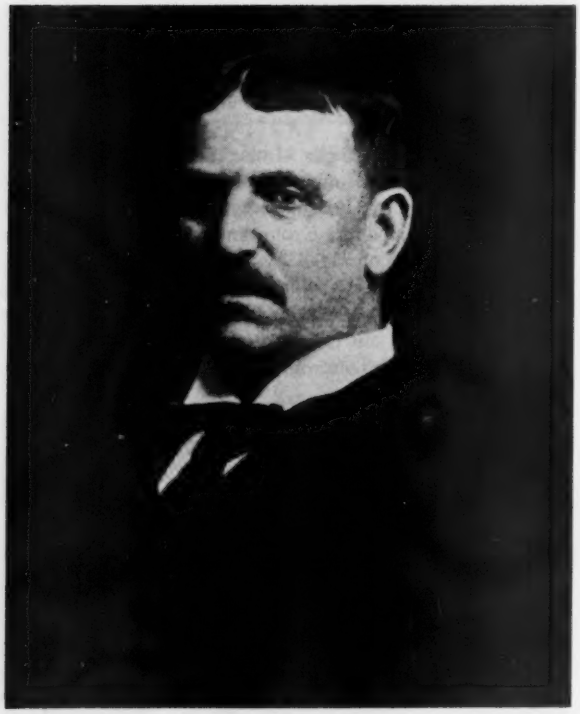
Frank W. Moore, Vice-President, became associated with the Company in 1918. A practical electrician, he did much to develop the early electric furnace construction. Later, and for several years, he was in charge of production in Blasdell. Today, still active in the interests of the Company, his counsel is eagerly sought by the younger men.

Dell M. Ramsey, Works Manager and Chief Engineer with a Mechanical Engineering degree from the University of Kentucky, has been with the Company since 1925. He developed the Exolon magnetic separator from an ingenious idea conceived by Fred R. Johnson, the inventor, and also is responsible for the unusual construction of the patented Exolon multiform grader. With the help of his staff, he laid out the unique and modern equipment of the new plant at Tonawanda, New York.

E. Ray Speare

Earl L. Hauman, an Electrochemical Engineer and graduate of the Massachusetts Institute of Technology (1916), became associated with the Company in 1925, after several years of practical experience in abrasive furnace operation. He is now Vice-President in charge of electric furnace operation and production in Thorold. Many of his refinements of furnace operation technique are unique. A number of his ideas have been patented.

Sam F. Walton, Technical Director and Ceramic Engineer with a B.S. degree in Ceramic Engineering from Iowa State College (1912), became associated with the Company in 1927. He brought to the Company a fund of knowledge of the use of abrasive grains and has been responsible in no small way for the advances made in the growth of the use of silicon carbide as a refractory material. In recognition of his attainments, the New York



Barnebe Campau

State College of Ceramics conferred on him the degree of Professional Ceramic Engineer in 1942. Mr. Walton is responsible for the technical control of the products of the Company and for developments in the technique of processing silicon carbide and aluminum oxide abrasives and refractories and their uses. He has several patents to his credit in the field of abrasives and refractories, both in their production and in their use.*

*See *Bull. Amer. Ceram. Soc.*, **23** [1] 21-22 (1944) for a photograph and an extensive biographical sketch of Mr. Walton.

J. S. Masin, Chief Chemist, a graduate of Brooklyn Polytechnic and postgraduate student at Columbia University, is in charge of the laboratories of the Company and is responsible for the chemical control of its products. He had many years of experience in the artificial abrasive field before becoming associated with the Company. He has been with the Company seven years.

The Sales Department is in charge of Ward E. Knowles, Sales Manager. He has been with the Company since 1934. The War Production Board took him to Washington for a while in 1943.

The finances and accounting are in the capable hands of Lucius E. Thayer, Treasurer and Counsel, and Elmer J. Berner, Assistant Treasurer, who joined the staff in 1934.

Charles R. Fletcher, now General Purchasing Agent, is one of the oldest employees. A graduate of Harvard (1886), he had been associated with the emery and corundum industry for many years. Before he took over the direction of the Company's crushing plant at Blasdell, he had been Works Manager for the Perth Amboy, New Jersey, and Chester, Massachusetts, plants of the Ashland Emery and Corundum Company.

In the Company's early years after Mr. Harty became General Manager, Charley Fletcher took an active interest in sales, especially of silicon carbide refractory grains.

Mr. Fletcher was elected Assistant Treasurer in 1923 and then Treasurer in 1924, and appointed Sales Manager. He resigned these active positions in 1934. Since 1934, he has been in charge of purchasing and, at an age when most men retire, he is at his desk every day.

Of the nearly four hundred employees, many have been with the Company more than ten years. The record shows five for 30 years, seventeen 25 to 30 years, fifteen 20 to 25 years, thirty-seven 15 to 20 years, and twenty-eight 10 to 15 years. Continuity of employment in good times and bad, in peacetime and wartime, has made this record possible.

PROPORTIONAL-MIXER KILN

By J. T. Robson

I. Introduction

The economy, from a fuel standpoint, of using hot preheated air for combustion is a well-known fact.

Assuming the composition of natural gas to be entirely methane (actually it averages 95% methane with varying quantities of ethane, carbon monoxide, hydrogen, oxygen, and carbon dioxide), the formula for combustion is as follows:

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O.$$

As air is 3.8 parts nitrogen and 1 part oxygen by volume, from the preceding formula 2 parts of oxygen are required, and consequently 7.6 parts of nitrogen, or 9.6 parts of air, are used for every part of methane or natural gas for complete combustion.

II. Theoretical Considerations

A saving in B.t.u. is possiole by using preheated air at 1400° in the combustion of a unit or 1 lb. of methane. Theoretically, methane cannot be ignited at the burner tip with less than 3 parts of air per 1 part of methane, so 70% of the air will be used at 1400°F. and the remaining 30% at 70°F.

Calculations

In the combustion of methane, 192,160 calories are available from 1 gram molecule or multiplying by 1.8 = 345,888 B.t.u. per pound molecule (Mueller[1]). (*References on p. 92.*)

1 lb. of methane (CH_4) = 345,888 B.t.u. ÷ 16 = 21,618 B.t.u.

Specific heat of air at 1400°F. = 0.246.

In the combustion of methane,

$$\underset{16}{CH_4} + \underset{64}{2O_2} + \underset{212.8}{7.6N_2} \longrightarrow CO_2 + 2H_2O + N_2.$$

Air or (64 parts oxygen) + 212.8 parts nitrogen × sp. ht. (0.246) × $t - t_1$ (1400 − 70) = 90,573 B.t.u. available from preheated air to burn 16 lb. of methane.

90,573 ÷ 16 = 5661 B.t.u. available from preheated air per pound CH_4 burned.

5661 B.t.u. ÷ 21,618 = 26.2% saving, using 1400°F. preheated air, but only 70% preheated air is used; therefore
70% × 26.2 = 18.34% saving, using 7 parts preheated air in a proportional-mixer kiln.

A typical example of an actual kiln consumption figure can be calculated as follows:

Assume a good average figure in the whiteware industry size installations, viz., 96,000 cu. ft. of gas per 24 hours, or 4000 cu. ft. of CH_4 per hour, using 70% of the theoretical air needed for combustion preheated at 1400°F. The air used is calculated on a dry basis and the fuel is 100% CH_4.

Factors

(1) Dry air is 21% oxygen by volume.
(2) One cubic foot of dry air weighs 0.0807 lb. at 0°C. and 760 mm.
(3) Specific heat of air = $0.234 + 0.0000173t$ lb. cal. per lb. (0–t°C.).
(4) Calorific power of methane at 32°F. = 962 B.t.u. per cu. ft.; (calculated) at 70°F. = 893 B.t.u. per cu. ft.
Constants and values are taken from tables of Butts.[2]

Calculations (Standard Conditions)

(1) $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$.

The ratio is 2 parts of oxygen to 1 part CH_4 by volume. Using 4000 cu. ft. of methane, 8000 cu. ft. of oxygen are needed to complete the combustion.

(2) To obtain this oxygen, there is needed
8000 ÷ 0.21 = 38,100 cu. ft. of air at standard conditions; only 70% of this amount, however, is preheated, so 70% of 38,100 = 26,670 cu. ft.
(3) The weight of this dry air = 26,670 × 0.0807 = 2152.3 lb.
(4) The heat absorbed by this weight of air in being heated from 70°F. (21°C.) to 1400°F. (760°C.) equals

Q_{21} = 2152.3 [0.234 + (0.0000173 × 21)] 21
= 2152.3 (0.2344) 21
= 10,594 lb. cal.

Q_{760} = 2152.3 [0.234 + (0.0000173 × 760)] 760
= 2153.3 (0.2471) 760
= 404,180 lb. cal.

$Q_{760} - Q_{21}$ = 404,180 − 10,594 = 393,586 lb. cal. of heat absorbed in the preheated air.

(5) The B.t.u. absorbed = 393,586 × 1.8 = 708,447.6 B.t.u.
(6) The heat generated by the complete combustion of 4000 cu. ft. of methane is (standard conditions) 4000 × 962 = 3,848,000 B.t.u.
(7) Heat recovered in preheated air.
Heat input = 3,848,000 B.t.u.
Heat to preheated air = 708,447 B.t.u.
Recovery = 708,477 ÷ 3,848,000 = 18.4%.

The foregoing calculations simply illustrate the high desirability from an economy standpoint of using hot combustion air, providing, of course, this hot air can be obtained from the waste heat or cooling gases.

Hot preheated air is not more generally used with gaseous fuels because it is difficult to get it to the burner or point of combustion. Usually high-temperature fans are required, which are expensive, difficult to maintain, and tend to lose heat from the air by radiation from the fan and its ducts or connections to and from the fan.

III. Development of Proportional-Mixer Kiln

To eliminate the undesirable feature of passing the hot air through a fan, a proportional-mixer kiln has been developed, wherein the hot air is obtained as shown on Fig. 1.

Cooling air is forced into the kiln at the discharge end by means of fan *A*. This air comes in direct contact with the cooling ware and picks up heat therefrom. The temperature of the air by the time it reaches port *B* opening directly into the ware tunnel averages from 1600° to ±2200°F., depending on the firing temperature, mass and type of ware, length of cooling zone, etc. Part of the air at port *B* is siphoned by means of the refractory venturis *C* and C_1. The injecting air through the nozzle is blown by fan *A* into the quick cooling panel *D*, or for the top venturi over the crown, at *E*. This air averages from 500° to 800°F.

The air then flows through ducts *F* and F_1 to the burner openings where it serves as air for combustion of the fuel gas. The gas plus three (3) volumes of air is introduced through the burner and mixed at the burner tip with the necessary hot air from the ducts for combustion. The average temperature of the air as it reaches the tip of the burner is from 1200° to 1400°F.

Thirty cubic feet of gas have been used per dozen on vitrified bisque with the proportional-mixer kiln compared with 50 cu. ft. of gas per dozen on kilns not equipped with the proportional-mixer system.

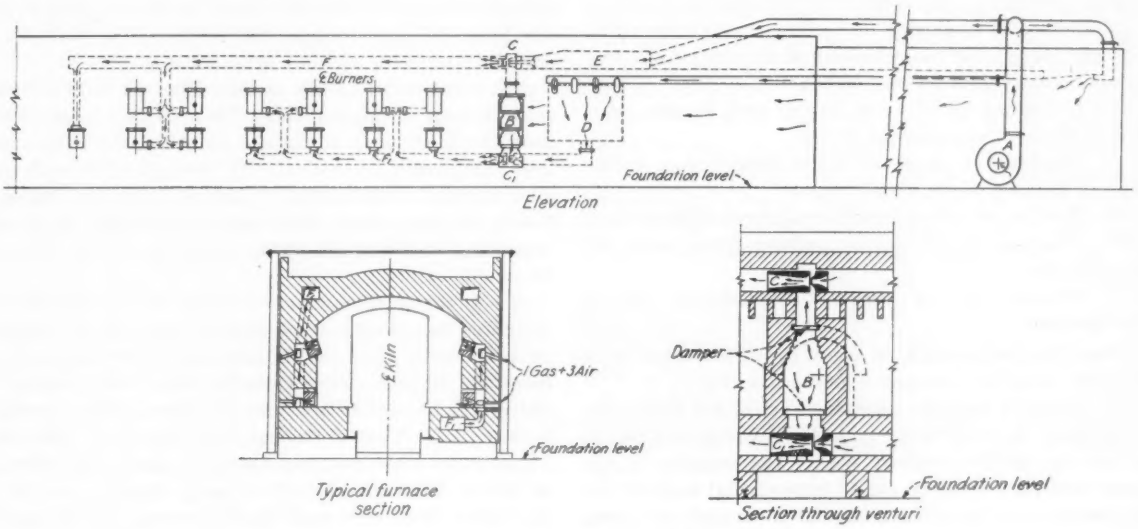


FIG. 1.—Proportional-mixer kiln.

On continuous kilns operating with the combustion right out in the tunnel in the ware, such as refractory kilns and flashed-brick kilns, much of the air for combustion comes directly down through the tunnel itself, so that actually in such kilns the fuel saving with the proportional-mixer type will not be so high. Actual tests run, however, ona refractory kiln wherein all the air for combustion (other than that in the ware tunnel itself) was introduced through the proportional-mixer flues at 1400° to 1600°F., indicated a saving of 15% fuel over that used when the proportional-mixer flue air was shut off entirely for a period of five days and the gas burned with the air in the ware tunnel itself.

Likewise, there are two 40-foot circular kilns in one plant, one a regular kiln and one a proportional-mixer kiln. The proportional-mixer kiln shows a fuel saving of 25 to 30% over the regular type. These figures, in general, show a greater saving than is theoretically true because the amount of secondary air at the burner is controlled more accurately than when outside air is inspirated at the burner itself. The secondary air introduced, moreover, is preheated air at around 1400°F. instead of 70°F., and this is normally a very appreciable quantity.

Of course, in utilizing the air from the discharge end for primary combustion as well as oxidizing air for the preheating end, the amount of waste heat from the kiln, which is ordinarily used for drying or space heating, is automatically decreased but not to the same extent as the amount of fuel saving.

IV. Summary

As an over-all saving of fuel, taking into account the lower quantity of waste heat available, the saving in fuel of a proportional-mixer kiln is 10 to 20% and, ignoring the waste heat, the saving is 15 to 30% in fuel.

Allied Engineering Division
Ferro Enamel Corporation
4150 East 56th Street
Cleveland 5, Ohio

REFERENCES

(1) W. A. Mueller, Fuel Calculation, d. 46. Edwards Bros., Inc., Ann Arbor, Mich., 1928. 135 pp.
(2) Allison Butts, Metallurgical Problems, 2d ed., pp. 18, 393, and 422. McGraw-Hill Book Co., Inc., New York, 1943. 446 pp.

Note: This paper was presented at the joint Autumn Meeting of the Materials and Equipment and White Wares Divisions, Uniontown, Pa., September 16, 1944. It was received September 21, 1944.

FUEL-OIL SYSTEM

By J. T. Robson

I. Introduction

During the gas shortage of the winter of 1944, many manufacturers were forced to convert to oil firing. In fact, more than fifty-one kilns were changed over by the Allied Engineering Division in this period. This change-over was done with the utmost speed and with the minimum amount of difficulty.

II. New System Designed

Knowing the many problems encountered in past experience in the oil-pumping system itself, the writer and his co-workers designed a system that would eliminate all of these difficulties, some of which were as follows:

(1) Firing different kilns at any desired oil pressure without interfering with other kiln pressures.

(2) Difficulty in getting oil to flow through the lines, not only because of the viscosity of the heavy oils but mainly because of air leakage on the suction side.

(3) Unloading oil into the outside tank because of a broken-down or frozen outside pump.

(4) Transferring oil to the inside tanks during breakdown or freezing of the outside pump.

(5) Feeding oil to the kiln with breakdown of kiln pumps.

(6) Maintaining the oil at uniform temperature 24 hours per day.

(7) Maintaining oil temperature constant up to the burners.

These possibilities and, in many cases, probabilities of difficulty have been overcome, as shown in Fig. 1.

(1) Using a separate pumping system for each individual kiln, the relief valve at each individual kiln can be set at any desired pressure within the capacity of the pump and part or all excess oil beyond that required for the burners can be either recirculated through the pump by opening valve 1 or closing 2 and 3. This will recirculate all the oil through the pump and might be desirable with just one kiln under fire. Valve 1 can be partially opened for recirculation, through the pump, and valves 2 and 15 partially opened and valves 24 and 25 closed for feeding to the next kiln in case its heater is not working and it is desired to raise the feed-line temperature to the next kiln. Likewise valve 3 can be all or partially opened to maintain the temperature in the inside tank. In this case, valves 1 and 2 can be closed or valve 1 can be opened slightly to keep up the temperature. If more heat is desired in the outside tank, the heated oil can actually be returned through open valves 3 and 6 and closed valves 4, 5, 7, 31, and 30.

With individual pumping units, moreover, each unit for each kiln is right at the kiln where the fireman will catch anything that goes wrong; this unit can be worked on without interfering with the other kilns.

(2) To operate the kiln pumps under pressure if there is air leakage in the feed line. Valves 8 or 9 from either inside tank are opened and the oil is pulled through the lines J_1, through J, open valve 16 through B, through the main pump, close valves 10, 30, 12, and 13, open 11 through line K, 26 and 27 closed, and valves 14 or 15 open or closed, depending on which kiln pump is used, and 20, 21, 25, and 24 closed.

(3) If the outside pump is not in working order and it is desired to unload a truck or tank car into the outside tank, the spare pumps at the kilns can be used to accomplish this. In such a case, valves 16 and 17 are closed and valves 19, 10, and 18 are opened. The oil flows through lines A, B, G, F, and H through open valve 20. Valves 14, 21, and 1 are closed, through the spare kiln pump, valve 22 is opened, 28 closed, through N and I, through open valve 23, valves 29 on each tank closed, through lines L and D into the main tank. Although these are only 1-inch pumps,

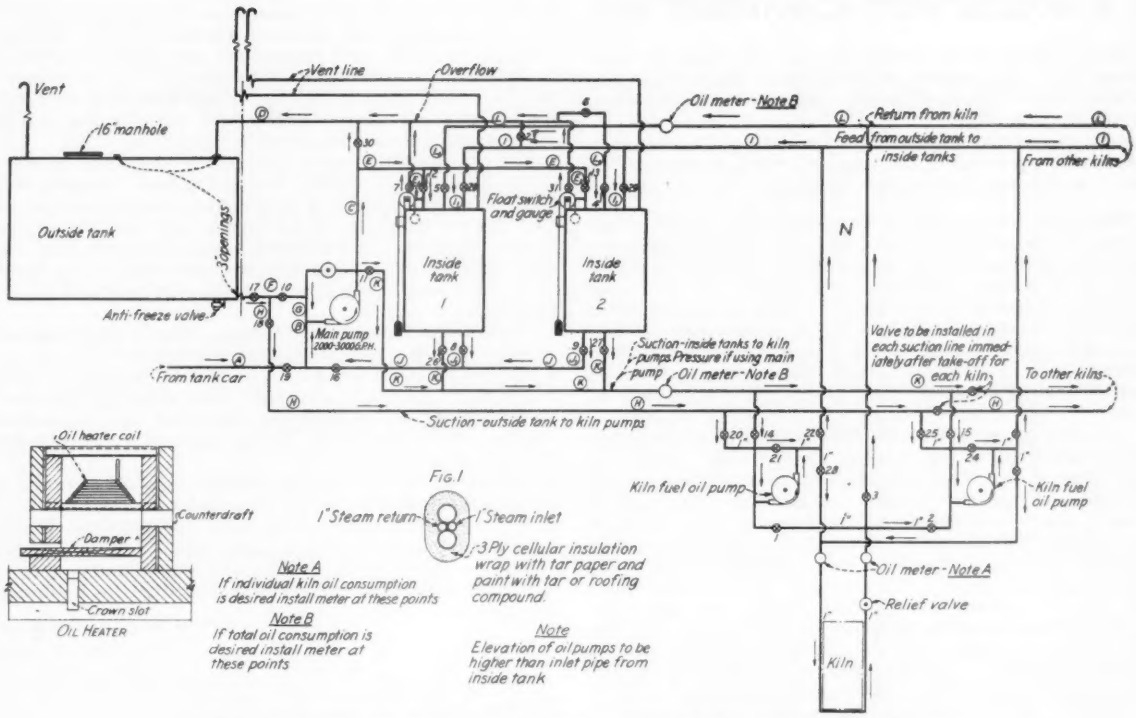

Vent
Vent line
Overflow
16" manhole
Outside tank
3 openings
Anti-freeze valve
Main pump 2000-3000 G.P.H.
From tank car
Oil meter - Note B
Return from kiln
Feed from outside tank to inside tanks
From other kilns
Float switch and gauge
Inside tank 1
Inside tank 2
N
Suction - inside tanks to kiln pumps. Pressure if using main pump
Oil meter - Note B
Valve to be installed in each suction line immediately after take-off for each kiln
To other kilns
Suction - outside tank to kiln pumps
Oil heater coil
Counterdraft
Damper
Crown slot
Oil Heater
Fig. 1
1" Steam return
1" Steam inlet
3 Ply cellular insulation wrap with tar paper and paint with tar or roofing compound.
Kiln fuel oil pump
Kiln fuel oil pump
Oil meter - Note A
Relief valve
Kiln
Note A
If individual kiln oil consumption is desired install meter at these points
Note B
If total oil consumption is desired install meter at these points
Note
Elevation of oil pumps to be higher than inlet pipe from inside tank

FIG. 1.—Typical fuel-oil pumping system with outside and inside tanks.

the tank car can be unloaded quickly by using two or more kiln spare pumps (whatever are available).

(4) To transfer oil from the outside tank to the kiln, if the outside tank pump will not operate to fill the inside tank, valve 17 is opened, 10 closed through *H*, valve 18 opened through *H*, valve 20 opened, valves 14 and 21 closed, through the pump; valve 22 opened, valve 28 closed, through *N*, through *I*, valve 23 closed, through valve 29 opened in tank not feeding kilns.

(5) To feed the kiln with the main outside tank pressure pump (assuming tank 1 is being used), open valve 8 through *J*, open valve 16 through *B*, through the pump, close 30, 12, and 13, open 11, through *K*, open 14, close 1, open 21, close 22, open 28, around the kiln, and return.

(6) To maintain the oil at uniform temperature from day to day and not be influenced by the outside-tank oil temperature, the two inside tanks 1 and 2 are used having preferably enough volume so that each one will handle the kilns 24 hours per day. While oil is being used from one tank, the other tank is filled and heated from recirculation as well as from the heat in the room itself. An automatic float-valve switch operates the shutting off of the pump when the inside tank is full, and usually a bell or signal light operated by the float switch notifies the fireman when the oil is below a certain level and when he is to switch tanks and start filling the tank again.

(7) Maintaining the oil temperature constant right up to the burners is accomplished by utilizing steam heat if available. A coil is used in the outside tank. The outside lines are heated with the steam pipes between and covered with insulation as shown in Fig. 1. In other words, lay the steam lines in contact with the outside lines and from the outside pump up to the inside tanks. It is well to insulate the inside tanks; then the lines must be thoroughly insulated up to and away from the heater, right up to the burner itself. Bunker C oil is heated to 240°F. and the air for combustion is carried at 300°F.

The drawing in the lower left-hand corner of Fig. 1 shows the regulated method of using waste heat from the kiln to attain this temperature.

The inlet pipes to the tanks must be run down at least two thirds the depth of the tanks; otherwise the oil will splash in entering the tank and be contaminated with air.

The oil is taken out of the bottom of the tanks so that no sludge can accumulate in the tank but is prevented from forming by constant circulation and consumption.

There are several variations from the preceding outline in this system, e.g., the outside and inside tanks can be above or below the ground. Considerably simpler systems have been used, but for ease of operation, accurately controlled firing, firing of heavy oil, and flexibility, the two-line inlet and two-line return system is well worth while.

ALLIED ENGINEERING DIVISION
FERRO ENAMEL CORPORATION
4150 EAST 56TH STREET
CLEVELAND 5, OHIO

NOTE: This paper was presented at the joint Autumn Meeting of the Materials and Equipment and White Wares Divisions, Uniontown, Pa., September 16, 1944. It was received September 21, 1944.

A. E. WALLER VISITS ROWANTREES KILN

The following article written by Laura S. Paddock is reprinted from the January, 1945, issue of *Good News*, the bulletin of the Columbus Society for the Hard of Hearing, Columbus, Ohio.

It is an interesting follow-up to the story of Miss Paddock which was published in the February, 1945, *Bulletin of The American Ceramic Society*, pp. 43–46.

When Dr. Waller* visited Rowantrees Kiln at Blue Hill, Maine, this summer and found that its ceramist and manager is hard of hearing, he suggested my writing you something of our village project for *Good News*. As ceramics is a leading industry in your State (which is, by the way, my native State) and as the ceramic department of Ohio State University is one of the foremost in the country, perhaps a little about our small village pottery from its hard-of-hearing director may be doubly interesting to you.

No other of our fifteen workers is hard of hearing, but they could all be so and carry on comfortably. Each one concentrates on his special task; three men throw shapes of clay on the potter's wheels; one man has a big room to himself where he prepares our local marine clay (some 35 tons a year) for the throwers; one man, who lost an eye in the last war, sprays the glazes on the once-fired ware; another loads and fires the three kilns; still another works by himself packing the finished pottery for shipment. A woman models and attaches handles on cups and pitchers and models flower and leaf decorations on covers, while a second examines each piece before and after firing and also weighs the glaze materials from my formulas.

So you can see that each worker is pretty much independent of the others, and good ears are not at all essential. Then there are the home workers, three women who model jam-jar covers with fruit decorations or small animal figures in their spare time. Come to think of it, one of these women is "slow of hearing," as they say here. In the past five years, she has made up to three thousand jam-jar covers with designs of fruits and flowers inspired by her garden which she cares for herself.

None of our workers has been eligible for active war service but all are lending a willing hand on the home front. They have served on the Observation Posts, two having won bars for more than a thousand hours and these were night hours mostly between midnight and four in the morning. Another drove the Kiln's station wagon equipped as an emergency ambulance. He happens to be the town treasurer, and one of the selectmen is also one of us. These are just examples of what all of our people have been doing and are doing for the village and for the war.

All of our workers have learned the potter's craft here at Rowantrees, for pottery has never been made locally as it was made in other Maine coast towns in Colonial days. Men who have been farmers, fishermen, storekeepers, gardeners, mechanics, and carpenters have become skilled potters. Our glaze man, a World War One veteran, whose son now in the Air Force we hope to take into the Pottery on his return, used to be cook on a four-master sailing vessel that carried Blue Hill granite to New York and brought back coal from Perth Amboy.

Nowadays no sailing ships or steamers ply the coast, but not long ago Blue Hill was a busy little port and in the eighties was a boom mining town when the copper mines enjoyed a brief success. Residues from the ores from these abandoned mines are used in some of Rowantrees unique glazes. The quarries that have furnished granite for the curbstones of New York City and the interior of the Washington Monument are no longer worked, but we have pulverized nearly a ton of it in the past year for one of the most important of our glaze materials.

Our workers have made nearly 50,000 pieces of pottery this year, mostly tableware, which we sell all over the country and export to Canada. During the summer, hundreds of vacationists come down the garden path to visit the Pottery and convince themselves that Rowantrees plates, cups, and saucers are not made in molds as is the customary method but are thrown on the potter's wheels. This hand technique of our Blue Hill men and women and our unique glazes have won for our remote village pottery a surprisingly wide reputation.

The deer-hunting season that brings thousands of hunters to Maine in November has just closed. During that time, there was scarcely a man among Rowantrees potters who did not take part of his week's vacation to go "gunning." But our big excitement was the mink that was shot right in the packing barn one morning, a very handsome mink and a fine shot that won the praise of all the other men.

Hereabouts deafness is common. Nearly every one has a hard-of-hearing relative and is accustomed to "speak up" a bit, so with my hearing aid I have no difficulty and quite forget that I have a hearing loss. Any of our local hard-of-hearing folk will always be welcomed as Rowantrees workers, for in pottery, as in any handcraft, they will find an ideal occupation.

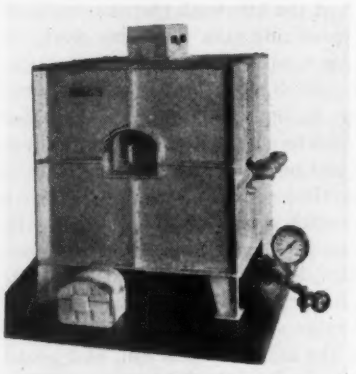
To my mind, the rapidly growing interest in crafts in every section of the country, the work of many State craft guilds, and the splendid progress of the American Craftsmen's Cooperative Council, Inc., New York, N. Y., will bring to the hard of hearing the opportunity and inspiration to seek out congenial crafts either for hobbies or vocations.

—Laura S. Paddock,
Rowantrees Kiln

* Associate Professor of Botany and Curator of the Botanical Garden, Ohio State University, Columbus, Ohio.

—Security in Unity—
The American Ceramic Society
A Union of Fellow Ceramists

REMMEY LABORATORY KILN No. 2150
Write for Bulletin F-2



FEATURES

- May be Held at Any Temperature from 1200°F. to 3200°F.
- Single Valve Control
- Uniform Temperature
- No Stack Required
- Numerous Uses
- Two New Refractories Used
- Three Piece Lining
- High Thermal Efficiency
- Welded Steel Case
- Use either City, Natural or Propane Gas

Dependable Refractories

RICHARD C. REMMEY SON CO.
Hedley Street and Delaware Ave. PHILADELPHIA 37, PA.

AMERICAN CERAMIC SOCIETY

Forty-Seventh Annual Program

THIRD WAR CONFERENCE
(In print)

GENERAL SESSION—POSTWAR PROBLEMS

Chairman: Edwin H. Fritz, President, The American Ceramic Society, Inc.

1. Postwar Employment

By F. D. Newbury: Vice-President, Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pa.

No issue has been more widely discussed than the question of full employment after the war. This paper will discuss only one phase of this broad question, namely, the size of the postwar-labor force and the number of civilian jobs that corresponds to a satisfactory level of the civilian employment. Unfortunately, this difficult statistical problem has become a political issue. President Roosevelt has promised 60 million "jobs," and this figure has been quite generally adopted by those who appear to be interested in inflating the size of the problem beyond the ability of private industry.

All of the high estimates of the size of the postwar-labor force start with the U. S. Census figures of 1940, which showed a labor force of nearly 53 million. If to this figure is added the normal annual net increase of 650,000 workers, there results a labor force of 57.3 million in 1947 or 59.3 million in 1950. The political figure of "60 million jobs" is probably a "free-hand" extension of these figures. A labor force as large as 60 million workers could not be recruited from the total population without robbing the schools and the homes of the nation.

A safer and more satisfactory approach to this statistical problem is to ignore the abnormal employment conditions of the war years, and to fall back on total population figures and the percentages of the several classes of men and women who normally appear in the peacetime-labor force. This method takes into account the trends toward boys and girls entering the labor force at older ages, because of longer schooling, and older men and women leaving the labor force at earlier ages because of social security and private pension plans. This method leads to an estimate of the 1950 labor force of not over 56 million.

Civilian employment (number of necessary jobs) is estimated by subtracting two million for military service and two million for the irreducible unemployment that exists even in prosperous times. This results in 52 million jobs. The difference between the political goal of 60 million jobs and a more realistic figure of 52 million jobs is the difference between an attainable objective and one that would be very difficult to reach and also socially undesirable.

2. Postwar Construction Project Plans, a Progress Report

By Thomas S. Holden: F. W. Dodge Corporation, 119 W. Fortieth St., New York 18, N. Y.

There is a total of six billion dollars of postwar construction work planned at the present time. Three phases of revival will be apparent. Three to six months after "X" day will be a time of reconversion; after that will follow a period of rapidly increasing work on the contracts in force; then will come the third period of real construction revival on a permanent basis. The volume in the immediate postwar years will be moderate.

3. Porcelain Enamel—the Versatile Finish

By F. L. Meacham: Manager Sales & Service, Chicago Vitreous Enamel Product Co., 1401–47 S. 55th Court, Cicero, Ill.

The history and development of porcelain enamel up to its present-day status are briefly discussed. The uses for porcelain enamel as a decorative and engineering finish are then described as well as the many properties it possesses that make it an outstanding material of lasting beauty, excellent corrosion protection, and the many desirable properties so eagerly sought in other finishes.

4. Consumer Credit Potential in Postwar Distribution

By R. H. Stout: President, Morris Plan Bankers Association, 1025 Connecticut Ave. N. W., Washington 6, D. C.

5. The Ceramic Industry and the Returned Service Man

By Arthur J. Blume, Captain F. A.: Headquarters: 1587th Service Command Unit, Armed Forces Induction Station, Huntington 18, W. Va.

The mental attitudes of the returned service man and his adjustment to industrial life are discussed. It is pointed out that the effects of military experience vary with the age and the previous industrial experience of the individual. Several hints on handling the returned man are presented.

6. War Veterans in the Postwar Ceramic Industry

By J. E. Eagle: Chief, Non-Metals Section, Miscellaneous Minerals Division, War Production Board, Department 7525, Washington 25, D. C.

DESIGN DIVISION PROGRAM

Chairman: W. A. Weldon, Locke Insulator Corporation, Baltimore 3, Md.
Secretary: Myrtle M. French, Art Institute of Chicago, Chicago, Ill.

Program Committee

C. M. Harder, Chairman, New York State College of Ceramics, Alfred, N. Y.
Vincent Broomhall, Continental Kilns, Incorporated, East Liverpool, Ohio
H. L. Moody, Rookwood Division, Sperti, Incorporated, Cincinnati 12, Ohio

1. Classification of Typical American-Made Figurines

By J. J. Svec: Industrial Publications, Incorporated, 59 East Van Buren St., Chicago 5, Ill.

Notes on merchandizing, styling, and technical features of figurines are presented.

2. Use of Wood Ash in a Low-Fire Mat Glaze

By H. L. Thurn: 709 East Juneau Ave., Milwaukee 2, Wis.

The development of a low-fire mat glaze for studio use is discussed. Part of the fluxes, silica, and alumina of the glaze are supplied by wood ash. The glaze is simple in materials used, easy to apply, and its application to the green ware eliminates one firing; it fires at cones 02 to 04.

3. California Pots, Potters, and the Public

By Daniel Rhodes: Permanente Metals Corporation, Palo Alto, Calif.

The methods of production and marketing of pottery produced in small shops are discussed.

4. Rookwood Plan and Problem, Sales and Advertising

By H. Leslie Moody: Rookwood Division, Sperti Incorporated, Cincinnati 12, Ohio

5. Study of Some Problems Related to Application of Underglaze Decals to Hotel Chinaware

By Alice M. Flannagan: Buffalo Pottery, Incorporated Buffalo 10, N. Y.

6. Cone 015 Relief Enamel for Decorating Vitreous China

By John H. Voorhies: Gladding, McBean & Company, 2901 Los Feliz Blvd., Los Angeles 26, Calif.

Studying the factors relative to satisfactory relief enamels, certain properties and qualifications are essential. Relief enamels must remain in relief and must not flow down during the maturing fire. They must have adequate acid and abrasion resistance. They should not craze and should accommodate as wide a color range as possible. The relief enamel developed in this study satisfies these various qualifications.

7. Development of Forms

By Alexander Giampietro: Alfred, N. Y.

Suggestions are given relating to basic laws governing the structural development of forms, with special application to pottery forms. Fundamentals of the sciences and natural forms are used as points of departure.

8. Postwar Era of the American Ceramic Industry

By Walter A. Weldon: Locke Insulator Corporation, Box A, Baltimore 3, Md.

An outline is given of the present size of the ceramic industry, its exports and imports, and what we are going to do about them. The expansion of the industry is also discussed with the future trends of the industry stressed from the viewpoint of an American potter.

9. Near Eastern and Early Chinese Pottery at the Buffalo Museum of Science

By C. E. Cummings: *Director*

GENERAL COMMITTEE

Honorary Chairman: Dean Major E. Holmes, New York State College of Ceramics, Alfred, N. Y.

General Committee Chairman: Milton H. Berns, Electro Refractories & Alloys Corp., Buffalo, N. Y.

Because of the wartime limitations on conventions, the meeting at Buffalo, N.Y., on April 16–17, 1945, will include only the Board of Trustees, the Past Presidents, and the Committee Chairmen. This group will meet for the transaction of urgent and official business which cannot be postponed.

ENAMEL DIVISION PROGRAM

Chairman: H. D. Carter, Harshaw Chemical Company, Cleveland 6, Ohio
Secretary: D. G. Moore, National Bureau of Standards, Washington 25, D. C.

Program Committee Chairman
W. W. Higgins, A. O. Smith Corporation, Milwaukee 1, Wis.

1. Factors Influencing Fluxing Action of Various Oxides in Low-Temperature Borosilicate Glasses (published *Jour. Amer. Ceram. Soc.*, 28 [2] 33–36 (1945))

By Howard R. Swift: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

Strontium, barium, and lead oxides were studied as fluxes in low-temperature borosilicate glasses by using the button-flow method. It was found that strontia may be superior to lead oxide as a flux in glasses high in fluorspar and low in alumina. This result was explained by the greater solubility of fluorides in strontia glasses, in which case the two fluxes, strontia and fluorspar, are acting together.

2. Molybdenum in Enamels: III, Typical Molybdenum Enamels (published *Jour. Amer. Ceram. Soc.*, 28 [3] 76–82 (1945))

By Karl Kautz: Climax Molybdenum Company, First National Bank Bldg., Canton 2, Ohio

Compositions and characteristics of various types of enamels using the most successful mill additions in Parts I and II are reported. The enamels used in this paper are (1) clear enamels (regular) for ground or colored coats, (2) clear enamels (acid resisting) for colored coats, (3) high lead clear enamels maturing below 1000°F., (4) raw or partially fritted enamels for ground or colored coats, and (5) white antimony enamels for direct application to the metal base. Reported for the first time are some white enamels containing molybdenum in the frit, which adhere to sheet steel without additions of molybdenum compounds to the mill.

3. Molybdenum in Enamels: IV, White Molybdenum Enamels (published *Jour. Amer. Ceram. Soc.*, 28 [3] 82–89 (1945))

By Karl Kautz: Climax Molybdenum Company, First National Bank Bldg., Canton 2, Ohio

Compositions and characteristics of white enamels containing molybdenum in the frit are reported. The white enamels studied are the following types: (1) regular white ground coats, (2) acid-resisting white ground coats, (3) regular white finish coats for direct application to metal base, (4) acid-resisting white finish coats for direct application to the metal, and (5) acid-resisting white cover coats.

4. Electrostatic Spraying of Porcelain Enamels

By James B. Willis: Pemco Corporation, Baltimore 24, Md.

The application of the process of electrostatic spraying to the porcelain enamel industry is described. The equipment and methods of using it are given in detail. Particular emphasis is placed on the preparation of enamel for electrostatic spraying and on theoretical considerations which have a direct bearing on the spraying process. The applicability and limitations of the use of this equipment in the enamel industry are considered.

5. Determination of Opacity of White Enamel Frits by a Nephelometric Method

By R. M. King: Department of Ceramic Engineering, Ohio State University, Columbus 10, Ohio

Powdered enamel frits were suspended in kerosene and the decrease in light transmission was measured with a Cenco-Sheard-Sanford photelometer. Similar measurements were made on the same frits after fusing and on fused mixtures of clay and frit to determine the influence of temperature and clay additions on light transmission. There results were correlated with reflectance values obtained by the usual method.

6. Comparison of Gouging Characteristics of Various Surfaces

By Ralph L. Cook: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

The resistance of various surfaces to gouging was determined on the Bureau of Standards gouging machine. The types of surfaces studied included several different enamel surfaces, various glaze surfaces, polished plate glass, and several typical plastic materials.

7. Properties and Uses of Several Clays in Porcelain Enamels

By Ralph L. Cook: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

The comparative effect of several clays on the physical characteristics of typical ground-coat and cover enamels was investigated. In the ground-coat enamels, the effect of the clays on the firing characteristics, the development of bubble structure, reboiling, and set characteristics were studied. Suitable additions of each of the clays were made to the following cover-enamel frits: (1) a superopaque antimony frit, (2) a zirconium frit, (3) a clear frit as used for colors, and (4) a fluoride frit; and the effect on reflectance, gloss, and the resistance to gouging was noted. Spectrophotometer curves were run on selected cover-enamel surfaces. The clays showed a widely varying effect on the set characteristics and the resulting bubble structure of the ground-coat enamels. The various clays in the antimony frit caused a wide variation in the gouging characteristics while, in the zirconium frit, the clays had less effect as the gouging values were uniformly high.

8. The NBS Ceramic Coatings for Exhaust Systems

By W. N. Harrison: National Bureau of Standards, Washington 25, D. C.

Work on ceramic coatings for steel, designed to protect the metal against corrosion under operating conditions of temperature and thermal shock entirely beyond the range involved in such uses as enamels on kitchen utensils, was begun at the National Bureau of Standards in 1942. The development of these coatings was continued during 1943, and at the request of the armed services, the application of such coatings specifically to the exhaust systems of aircraft engines was studied. In June, 1943, a report was made to the armed services and to a number of companies in the enamel and aircraft industries which had cooperated, in

ENAMEL DIVISION PROGRAM (concluded)

which the superior performance of coatings which had been developed in that study, as compared with the conventional type of porcelain enamels, was strongly indicated. One of the coatings described in that report was designated as NBS No. A-19, and exhaust stacks with this coating have since been brought into regular production for use on a number of models of aircraft. This type of coating has also been specified for certain vehicles by the Army Ordnance Department, which also has under consideration the extension of its use to include a large percentage of the vehicles manufactured for the Army. Somewhat different ceramic coatings developed by the National Bureau of Standards have been specified by the Navy Department, Bureau of Ships, for use on certain craft equipped with large wet mufflers and others having dry mufflers. A cooperative project between the Bureau of Ships, the Naval Engineering Experiment Station, and the Bureau of Standards is under way for the purpose of further development of ceramic coatings for wet mufflers.

9. Titanium Steel for Vitreous Enameling

By E. Wainer and G. F. Comstock: Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.

Steel containing sufficient titanium to combine with all of the carbon does not react with vitreous enamels like ordinary low-carbon steel or ingot iron so that white cover-coat enamels, without a ground coat, can be fused on it without blistering or black specking. The titanium content must be more than 4.5 times the carbon content. This steel has been made commercially by the basic open-hearth process, and the requirements for successful manufacture are explained. It is of excellent quality for deep-drawing, and it has unusually good sagging resistance at enameling temperatures.

Preparation of this steel for successful enameling requires careful attention to details, which are explained. Proper pickling and rinsing are especially important. Nickel flashing to the correct degree is generally essential, with most enamels, for satisfactory adherence. Single-coat white enameling is possible with this steel under ideal conditions, but, in general commercial practice, two half coats are preferable as insurance against defects that are not due to steel quality.

10. Study of Nickel Flashing and Its Relation to Enamel Adherence

By E. Wainer and W. J. Baldwin: Research Laboratories, Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.

Nickel flashing as applied to enameling stock is shown to be primarily metallic nickel. The role of nickel in developing enamel adherence is apparently bound up with the retardation of oxidation of the base iron which the nickel flash imparts in the enameling cycles. Using cover coats directly on iron, the amount of nickel required will vary with each particular enamel composition.

The problem of adherence is entirely a corrosion phenomenon of the base iron developed by the action of gases and other agents which may be present at enameling temperatures. The equilibria developed at enameling temperatures, particularly the gas equilibria, are strongly affected by the presence of nickel.

Some evidence as to the nature of the adherence-promoting oxides is presented.

11. An Evaluation of One-Coat Enamels for Kitchenware

By Leon J. Frost: Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.

12. Crazing of Electric Stove Tops in Service

By R. L. Fellows: Chicago Vitreous Enamel Product Company, Cicero, Ill.

Examination of crazed stove tops show two types of crazing; one is in the form of a network of cracks, while the other occurs in parallel lines. The former is a thermal-shock failure; the latter occurs in the normal use of the stove. The craze lines are caused by localized heating of the stove top and are a deflection failure of the enamel.

Observations were made of the effect of weight of application of enamel, types of enamel, and stress in enamel.

13. Properties of Enamel Slips: II, Suspension of Enamel Frits

By Burnham W. King, Jr., Herbert D. Carter, and Harry C. Draker: Harshaw Chemical Company, 1945 East 97th St., Cleveland 6, Ohio

The mechanism of suspending enamel frits was studied in relation to the effect of the soluble salts dissolved from the frits and the dispensing properties of the frits themselves. Data are given concerning the effect of aging on soluble salts and the enamel pickup weight, along with information on the effect of various special salts.

GLASS DIVISION PROGRAM

Chairman: K. C. Lyon, Armstrong Cork Company, Millville, N. J.
Secretary: S. R. Scholes, New York State College of Ceramics, Alfred, N. Y.

Program Committee Chairman
Louis Navias, General Electric Company, Schenectady 5, N. Y.

1. Defects in Glass Caused by Working Conditions

By W. F. Curtis: Fostoria Glass Company, Moundsville, W. Va.

The purpose of this paper is to form a background for a discussion on the problem of defective glass due to working conditions as found in hand plants. Some of the more common defects, such as cords, blisters, seeds, laps, wave, chill marks, crizzels, and smears, are listed and their causes discussed. The temperature of the glass, correct gathering punty or pipe, the use of proper marver plate or bit plate, the temperature of the molds, and improper handling tools are some of the problems that enter into the discussion. There is also the problem of the inept, untrained, and unskilled workman which is acute at the present time under the critical manpower shortage.

2. Constitution of Extra Dense Flint Glasses

By K. Fajans: Department of Chemistry, University of Michigan, Ann Arbor, Mich., and Glass Science; and N. J. Kreidl: Bausch & Lomb Optical Company Rochester 2, N. Y.

The formation of glass is favored by such properties of ions and molecules which are hindering the transition from their arrangement in the viscous liquid state to the thermodynamically more stable crystalline state. In the case of network-forming oxygen ions, the favorable property is their strong binding and considerable deviation from spherical symmetry due to the two-sided strongly polarizing action of the neighboring cations B^{3+}, Si^{4+}, P^{5+}.

The interlinkage of SiO_4, PO_4, BO_4, or BO_3 groups hitherto was believed to be a prerequisite of glass formation unless some other ion capable of substituting for silicon could partially take its place in similar groups. The stability of silicate, borate, phosphate glasses with very high lead content has been little understood because the large Pb^{++} ion could not be supposed to replace the small B^{3+}, Si^{4+}, P^{5+} as a network former. For the same reason, and being only doubly charged, it cannot be assumed to strongly polarize the O^{2-} ions.

A theoretical study of the polarization of cations by anions leads to a new picture of the constitution of extra dense flint glasses. The six S^2 electrons of Pb^{++} are easily polarizable and can be expected to be repelled and loosened in the glass by the surrounding anions. It can be shown that this deformation of Pb^{++} leads to a strengthening of its binding and to a decrease of its free orientation.

3. Flow Lines in a Continuous Melting Glass Furnace as Determined by Cobalt Oxide and Pictured on Color Photographs

By Vernon W. Lenz: Owens-Corning Fiberglas Corporation, Newark, Ohio

The results of a study of glass flow in a direct-fired, continuous melting tank can be used to establish control-testing schedules and tank dimensional relationships. Three primary convection spirals are indicated. Normal convection currents produce good mixing. The methods used in making the study are explained. The use of coloring agent and color photographs as a means of recording the results are presented as a new technique for studies of this type.

4. High-Temperature Concentric Cylinder Viscosimeter for Routine Control Testing

By Vernon W. Lenz: Owens-Corning Fiberglas Corporation, Newark, Ohio

A high-temperature viscosimeter for rapid control testing of production-line glass has been constructed. The apparatus is a modification of Lillie's concentric cylinder viscosimeter, designed to give control-test accuracy and reliability at a rate of speed commensurate with the requirements for this type of measurement. Details of the construction are presented. Calibration of the instrument was made by running a curve in the temperature range of 2150° to 2600°F. on a standard glass calibrated at Corning Glass Works. Routine control testing is carried on by obtaining the viscosity at a constant temperature of 2250°F.; it is possible to make one test per hour. Representative curves are presented to show the applicability of the apparatus for control work.

5. Method for Measuring the Fining Times of Glasses

By A. K. Lyle: Hartford-Empire Company, Hartford, Conn.

A method is described for measuring the time required to produce seed-free glass. The results of tests on several glasses are presented to show that the fining time is an independent property and not a function of viscosity. A procedure is described for estimating tonnage-temperature schedules for continuous furnaces.

6. High-Titania Glasses, I

By Alexis G. Pincus: American Optical Co., Southbridge, Mass., and William Colbert: Glass Science, State College, Pa.

Titania can be introduced into sodium silicate glasses to a much larger proportion (up to 50 weight per cent) than has been generally recognized. The melts of these titanium sodium silicates are very fluid and form colorless transparent glasses on cooling. Data are presented on several properties of these glasses, such as penetration modulus, thermal expansion, and chemical durability.

7. High-Titania Glasses, II

By Alexis G. Pincus: American Optical Co., Southbridge, Mass., and William Colbert: Glass Science, State College, Pa.

High-titania and high-lead glasses are strikingly similar in their optical properties such as refractive index and dispersion. This is also true of the influence of colors of base glasses with a high titania content. Comparative studies are presented on the influence of the addition of titania and lead oxide on several glass colorants.

GLASS DIVISION PROGRAM (concluded)

8. New Law for Flow Processes in Glass

By Richard E. Powell: Princeton University, Princeton, N. J., and Glass Science, State College, Pa.

From the fundamental theory of the flow of matter, it is deduced that the rate of flow of substances like glass should not obey the Newtonian law,

$$(\text{Rate of flow}) = \text{const. (force)},$$

but should rather obey the hyperbolic-sine law,

$$(\text{Rate of flow}) = \text{const. } \sinh (\text{const.} \times \text{force}).$$

This latter law reduces to the Newtonian law for small forces.

The hyperbolic-sine law in its integrated form is applied to the annealing of glass and to such other time-dependent processes as the elastic after-effect, the change of refractive index and density with time, and the change of electrical properties with time.

This new theory not only agrees quantitatively with experiment but also provides a single law for the interpretation of various time-dependent phenomena.

9. Supersonics as New Tool for Glass Research

By Hans Mueller: Massachusetts Institute of Technology, Cambridge 39, Mass.

Glass blocks of any size or shape can be set into elastic vibrations by means of quartz plates driven electrically by a radio frequency oscillator. The vibrations give rise to standing wave patterns which become visible in observation with polarized light. At high frequencies, of the order of 10 million cycles per second, the waves create optical diffraction effects. Studies of these optical effects and of the electrical reaction on the driving circuit furnish information about the elastic, photoelastic, and viscous properties of the glass. Young's modulus, Poisson's ratio, Neumann's photoelastic constants, and the damping constant for elastic vibrations are obtained with an accuracy exceeding 1% from a single experiment on a small glass sample.

10. Glimpses of the Glass Division's Twenty-Five Years

By S. R. Scholes: Department of Glass Technology, New York State College of Ceramics, Alfred, N. Y.

The points discussed in this review are as follows: statistics, review of the organization and official personnel, titles of significant papers, and pictures.

11. Factors Which Govern Fluorescence in Glass

By Luke Thorington and Ralston Russell, Jr.: Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., and Alexander Silverman: Department of Chemistry, University of Pittsburgh, Pittsburgh 13, Pa.

A progress report is given on the study of the influence of minute amounts of substances as inhibitors of fluorescence in glass. Monochromatic light is employed to insure comparable results.

12. Tracing the Flow in Glass Tank Furnaces

By F. L. Bishop, Jr.: American Window Glass Company, Arnold, Pa.

By adding a small amount of a rare earth to a definite portion of batch, the velocity, direction of flow, and amount of surface flow can be determined. These are found by either the resultant slight fluorescence of samples taken at intervals or by the change in transmission for certain wave lengths of ultraviolet light. Sample results are shown and discussed.

13. Glass Densities by Settling in Heavy Liquids: Water-Bath Apparatus and Method for Production Control in Glass Plants

By Mellen A. Knight: Preston Laboratories, Box 847, Butler, Pa.

A rapid and reliable method involving simple apparatus and techniques is described, with specifications for the necessary equipment. This method consists of the settling of lumps of glass in a heavy-liquids mixture by means of uniform heating. Each run is calibrated by including a standard lump among the samples. Similar techniques have proved useful in plant practice. The present method gives quickly more reliable results than does the weighing method utilizing Archimedes buoyancy principle. It is the simplest method of the various sink-float techniques using heavy liquids that have been tried to date. Repeated runs on pieces of glasses show the standard deviation of the method to be less than 0.0001 gm. per cc. The method shows great promise as a means of obtaining density data quickly for quality control work in glass plants.

14. Microstrength of Glass

By H. W. Powell and F. W. Preston: Preston Laboratories, Box 847, Butler, Pa.

It is shown experimentally that if a minute area of a large piece of glass is tested for tensile strength, the stress supported is comparable with that of fine glass fibers and is some 50 or 100 times the "strength" of the large piece tested in any of the ordinary ways. This can be accomplished by pressing a small steel ball upon the glass surface, and so stressing, in tension, a minute annular zone around the circle of contact.

MATERIALS AND EQUIPMENT DIVISION PROGRAM

Chairman: J. R. Kauffman, Allied Engineering Company, Millville, N. J.
Acting Chairman: J. F. Day, 1901 Dresden Road, Zanesville, Ohio
Secretary: V. J. Roehm, Kentucky Clay Mining Company, Alliance, Ohio

Program Committee
W. E. Dougherty, Chairman, O. Hommel Company, Pittsburgh 30, Pa.
E. W. Emrich, R. T. Vanderbilt Laboratories, East Norwalk, Conn.
J. S. Breitenstein, Titanium Division, National Lead Company, South Amboy, N. J.

1. Drying Clayware with Infrared Radiation

By Leonard H. Hepner: Trenton Potteries Company, Trenton, N. J.

The use of this method has resulted in a great reduction of drying time, increased production from given floor area, decreased handling, and decreased warpage. The type and cost of equipment are described and compared with other types of drying equipment. Some of the drying problems and observed limitations are described.

2. Infrared Radiation Looks at the Ceramic Industry

By Ira J. Barber: Fostoria Pressed Steel Corporation, Fostoria, Ohio

The author discusses the application of infrared radiation to ceramic processes from an abstract point of view. The following topics are discussed: (1) heat fundamentals, (2) basic dehydration and drying, (3) theoretical considerations as applied to ceramics, (4) mathematical considerations, (5) air flow, and (6) economics.

3. The Infrared Principle, What It Is and What It Does

By William H. Tesmer: Burdett Manufacturing Company, 19 N. Loomis St., Chicago 7, Ill.

4. Radiant and High-Temperature Gas Heat in Ceramic Firing

By Emil Blaha: Ceramic Engineering Division, Selas Corporation of America, Philadelphia 34, Pa.

This paper brings up to date the information pertaining to radiant gas-fired equipment. A new technique of high-temperature kiln firing (by recuperative means) to 3400°F. is also fully described.

5. The Automatic Jigger

By Walter H. Emerson: Homer Laughlin China Company, Newell, W. Va.

6. A New "Batting-Out" Machine

By F. C. Henderson: Royal China Company, Sebring, Ohio

7. New Developments in Glaze Spraying Equipment

By Howard V. Schweitzer: Schweitzer Equipment Company, 306 Chester-Twelfth Bldg., Cleveland, Ohio

8. Unit Dust Collectors for Use in the Ceramic Industry

By M. R. Robinson: Robinson Ventilating Company, Zelienople, Pa.

9. Thermal Study of Kiln Furniture, A Progress Report

By W. E. Williams: Ceramic Supply Company, Crooksville, Ohio

A study has been made of the thermal properties of sagger, slab, post, and hiller compositions. Some work has been done in correlating facts concerning the effect of fired strength, grog size, and kyanite, silicon carbide, and talc additions on the thermal expansion. Some general remarks concerning phases of further research are included.

10. Study of Shrinkage vs. Pressure in Dry-Pressing Processes

By George D. Ford: Mosaic Tile Company, Zanesville, Ohio

11. Beneficiation of South Carolina Sillimanite Schists

By Carl Rampacek, B. H. Clemmons, and J. Bruce Clemmer: U. S. Bureau of Mines, Southern Experiment Station, Tuscaloosa, Ala.

Laboratory batch and pilot-plant tests demonstrated that the South Carolina sillimanite schists are amenable to beneficiation by recognized mineral-dressing methods. Flotation tests on a number of small samples indicated that the schists containing prismatic sillimanite responded more readily to treatment than those containing fibrous sillimanite.

Batch testing of the small samples was supplemented by continuous trial runs in the Laboratory pilot plant on a schist from the Pelzer, S. C., area. The schist, containing 17% prismatic sillimanite, was ground to 20-mesh and concentrated by a combination of tabling and flotation supplemented by magnetic separation of the concentrates. In an average test, 82% of the sillimanite was recovered in concentrates which contained 99% sillimanite and 1.04% total ferric oxide.

The concentrates were tests at the Electrotechnical Laboratory of the Bureau of Mines, Norris, Tenn., for refractory properties. Standard-size brick made from the concentrates met A.S.T.M. and the more severe Navy reheat-test specifications for superduty refractories.

12. Development of Zircon as a Versatile Ceramic Material

By N. R. Thielke and H. W. Jamison: Orefraction, Incorporated, 7505 Meade St., Pittsburgh 8, Pa.

A survey is presented of the development and applications of zircon in modern ceramics. The distribution, mineral occurrences, and commercial deposits are described, and mining and beneficiation methods are outlined. The physical and chemical properties of various commercial zircon products especially interesting to the ceramic engineer are tabulated, with particular reference to the application of zircon in the fields of refractories, enamels, glazes, and special porcelains.

13. Recent Developments in Grinding Ceramic Materials in Pebble, Ball, and Tube Mills

By G. F. Metz: Hardinge Company, York, Pa.

New grinding media, dry- and wet-grinding applications on a number of ceramic materials, and various arrangements of mills, classifiers, and other auxiliary equipment are described in detail.

14. Manufacturing Control Employing X-Ray Diffraction Methods

By F. G. Firth: North American Philips Company, Incorpoated, 100 East 42nd St., New York 17, N. Y.

The use of the spectrometer and other X-ray diffraction equipment is described as related to the quantitative determination of raw materials in the ceramic industry. Other

MATERIALS AND EQUIPMENT DIVISION PROGRAM (concluded)

points discussed are as follows: (1) the possibilities of following accurately the effects of heat-treatment, (2) discussion of particle-size evaluation with a spectrometer by means of half-line width intensity, which gives values for average particle size only, and (3) discussion of the newer method of low-angle scattering in terms of particle-size distribution.

15. Some Clay-Water Properties of Certain Clay Minerals

(published *Jour. Amer. Ceram. Soc.*, **28** [3] 90–95 (1945))

By R. E. Grim and F. L. Cuthbert: State Geological Survey Division, University of Illinois Campus, Urbana, Ill.

Computed values are given for the thickness of the water film adsorbed on the surfaces of the various clay minerals when clays composed of such minerals develop specific plastic characteristics. Based on such values, the following concept of clay-water relationships is presented: The dominant factor determining the plastic properties of clays is the rigidity of the water held on the surfaces of the clay minerals, and the point of beginning of the transition of completely rigid water to liquid water is marked by great changes in such properties. Each type of clay mineral seems to have a characteristic ability to stabilize water, and the exchangeable ions also exert an influence. The reaction between water and kaolinite or halloysite may require considerable time so that there is frequently a time lag after mixing clays composed of such minerals before the plastic properties are fully developed.

Applications of the foregoing concept in the fields of geology, ceramics, and soil mechanics are suggested.

16. Coatings for Wire-Wound Resistors

By Edward E. Marbaker: Mellon Institute of Industrial Research, Pittsburgh 13, Pa. (Investigator, Research Project NRC-538 and OPRD 483)

This paper describes the experimental work carried out by the O. Hommel Fellowship, Mellon Institute, under contract of the O. Hommel Company with the Office of Production Research and Development of the War Production Board, to develop a coating for wire-wound resistors which would pass the Grade 1, Class I qualification tests of Navy Specification Re 13A 372J. An outline of the methods used, a general survey of the types of coating considered, generalizations concerning requirements, and conclusions are presented.

The work includes studies of the conventional enameled Nichrome-wound steatite tube resistors which consisted of an investigation of the properties of tubes made from steatite and other ceramic bodies and the testing of vitreous enamels formulated for use as resistor coatings.

When it became apparent that steatite tubes have insufficient resistance to thermal shock and that the disparity among the expansivities of the components of this type of resistor is so great that the formulation of an enamel having satisfactory properties is very difficult, if not impossible, an extended effort was made to develop a resistor in which the wire was wound on a preenameled steel core and then coated with a suitable cover-coat enamel. Considerable progress was made as far as the enamel coating was concerned, but nonshort-circuiting terminals were found to be necessary and a completely satisfactory design was not worked out except for testing purposes.

A resistor that fulfilled the requirements with respect to resistance to thermal shock and moisture penetration was developed from a tube of zircon porcelain, wound with Kovar wire and coated with Pyrex-brand glass, the expansivities of all of which are low and within a relatively narrow range. Except for the fact that the wire used in this combination has too high a thermal coefficient of resistance, this type of resistor could be considered capable of meeting the Grade 1, Class I specification.

A silicone resin recently developed was applied to various types of tubes wound with different resistance wires fastened to either copper tabs or ferrules, and cured at a maximum temperature of 375°C.

This coating has a rubbery consistency and is not wet by water. Resistors coated with this material have fulfilled the requirements of the Grade 1, Class I qualification tests.

REFRACTORIES DIVISION PROGRAM

Chairman: W. R. Kerr, Armstrong Cork Company, Beaver Falls, Pa.
Secretary: E. E. Callinan, Standard Steel Works Division, Baldwin Locomotive Works, Burnham, Mifflin Co., Pa.

Program Committee
C. A. Freeman, A. P. Green Fire Brick Company, Mexico, Mo.
W. S. Debenham, Carnegie-Illinois Steel Company, Chicago 90, Ill.
B. L. Dorsey, Jones & Laughlin Steel Company, Pittsburgh 2, Pa.

1. Testing Chrome-Magnesite Brick for Resistance to Iron Oxide Bursting

By Samuel Zerfoss: Department of Ceramics; and H. M. Davis: Department of Metallurgy, Pennsylvania State College, State College, Pa.

The probable mechanism of the iron oxide bursting of chrome-magnesite brick is discussed. An attempt was made to duplicate this effect in the laboratory. Results indicate that the bursting can be simulated in a laboratory experiment provided the atmosphere of the furnace is such that the penetrating iron oxide liquid is rich in magnetite. A test is proposed for characterizing the bursting resistance of various brick.

2. Furnace for Multiple Testing of Reduced Size Samples Under Load

By R. L. Hess and Samuel Zerfoss: Department of Ceramics, Pennsylvania State College, State College, Pa.

A brief summary of American and European testing procedure for refractoriness-under-load is given with special reference to the advantages of using samples smaller than standard size. The construction and operation of a furnace using four $4^1/_2$ x $2^1/_4$ x $1^1/_4$ in. samples are described.

3. Effect of a Number of Oxides on Surface Tension of Silicate Melts

By C. R. Amberg: New York State College of Ceramics, Alfred, N. Y.

The surface tension effects of MoO_3, V_2O_5, WO_3, Sb_2O_3, Ni_3O_4, Co_3O_4, MnO_2, UO_2, and As_2O_3 have been determined in a glaze, a glass, and an enamel composition. Certain practical applications in the fields of refractories and abrasives have been worked out in cooperation with the Exolon Company.

4. Physical Properties of Some High-Temperature Refractory Compositions

By Gordon R. Pole and Alfred W. Beinlich, Jr.: Tennessee Valley Authority, Wilson Dam, Ala.

In the course of an investigation which involved studies of pyrochemical reactions, it was necessary to develop a refractory that could be used satisfactorily at temperatures in the range of 1800° to 2200°C. It was found that calcined magnesia (96% MgO) or electrically fused magnesia (98% MgO) could be bonded adequately by mixing sized aggregates with 2.5% by weight of light-burned seawater magnesia and wetting with a 24° Bé. solution of magnesium chloride. Large shapes of these compositions which had been fired at 1450°C. were satisfactory for use in the temperature range employed.

Small-scale studies of the properties of various refractory bodies showed that compositions of relatively pure limestone or dolomite readily hydrated in water even after being fired to 2100°C., which would make them unsuitable for refractory uses. The addition of either silica, alumina, zirconia, chromic oxide, or combinations of these oxides to dolomite or lime resulted in refractories stable against hydration.

The inversion of zirconia was reduced appreciably by the addition of 5% magnesia. Zirconium pyrophosphate was found to be highly refractory and to have a coefficient of thermal expansion less than that of fused quartz. $BaO \cdot ZrO_2$ and $CaO \cdot ZrO_2$ were found to be refractory-stable bodies after firing to 2100°C. with no inversion up to 1200°C. and with coefficients of expansion less than that of electrically fused magnesia.

Small- and large-scale tests of a $MgO \cdot Cr_2O_3$-spinel composition showed this material to be highly refractory with a low coefficient of expansion; the compound, however, loses its Cr_2O_3 content at temperatures above 1700°C.

5. Screening Efficiency of a Dry-Pan Grinding System

By D. P. Brown and Ralph Hess, Jr.: North American Refractories Company, Cleveland 14, Ohio.

The efficiency of an industrial screening operation was measured by using the screen analyses of feed to screens, product passing the screens, and tailings. From these data, evaluation of the screening operation and the effect of the dry-pan grind on the screening efficiency were made according to published formulas. The effects of several operating variables in grinding and screening are shown,

6. Refractories in the Texas Area

By Forrest K. Pence: University of Texas, Austin, Texas

7. Deposits of Kaolin and Sand in Robertson and Falls Counties, Texas

By R. C. Redfield: Texas Station, U. S. Bureau of Mines, Austin, Texas

8. Insulation in Connection with Refractories—Types and Properties

By Paul G. Herold: Missouri School of Mines and Metallurgy, Rolla, Mo.

A survey and summary of the different types of insulation that are used in connection with refractories installations in current practice are presented. The types of insulation are discussed, bringing out the physical properties and methods of manufacture of typical processes. The paper divides the insulating field as it applies to refractories installations into two classes, (1) insulating firebrick and (2) low-temperature insulation. The field of application of both types is discussed as well as a summary of the limitations of each type with respect to service conditions.

9. Use of Insulation in the Lime Industry

By W. R. Cliffe: Consulting Engineer, Lime Industry Management & Engineering, Hershey, Pa.

REFRACTORIES DIVISION PROGRAM (concluded)

The application of insulation to kilns and furnaces used in the manufacture of lime is presented. The zones and areas of different type kilns and coolers are discussed, giving the reasons for insulating these zones as well as the types of insulation employed. The success which the use of insulation has met in this industry as to fuel savings and the extent of acceptance by the industry is mentioned.

10. Insulation in the Portland Cement Industry

By Ray A. Witschey: A. P. Green Fire Brick Company, Mexico, Mo.

The Portland cement industry utilizes insulation in rotary kilns and auxiliary equipment. Where exit gases from the kiln are used in waste-heat boilers, it is general practice to use insulation in the settling chambers, waste-heat flues, and boilers as well as in the kiln. Although insulation of rotary kilns is generally considered to be the most difficult of insulation applications, it has become common practice to insulate kilns throughout the major portion of intermediate and cold-zone sections. Various materials and methods tried are summarized. Details of construction of the conventional method as well as improvements are discussed. Some newer methods along with recent attempts to insulate the burning-zone sections of kilns are described.

The advantages of insulation as well as the economies effected through its use are given, and the limitations of existing methods are summarized. The need for better materials and more satisfactory methods is stressed.

11. X-Ray Diffraction Data for Compounds in the CaO–MgO–SiO_2 System

By C. Burton Clark: Harbison-Walker Refractories Company, Pittsburgh 22, Pa.

X-ray diffraction data by the powder method for compounds in the CaO–MgO–SiO_2 system are widely scattered in the literature. In certain instances, there is need of revision of the earlier data, due to the improvement in equipment and technique. Therefore, X-ray patterns have been made and the data are here presented covering nineteen of the compounds in the system CaO–MgO–SiO_2. These represent all the known compounds which are stable and several which are metastable at room temperature.

12. Stress-Strain Relations in Ceramic Materials

By J. O. Everhart and Majorie Lassettre: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

Work covered in this paper involves a study of deformation characteristics of a number of ceramic materials under load. A new technique using the electric strain gauge has been developed. This permits measuring deformations of a character and magnitude heretofore impossible.

13. Factors Influencing Size Variations in Stiff-Mud Fire Clay Refractories

By J. O. Everhart: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

The effect of forming pressures, moisture content, cutting, grain size, drying rate, and firing technique on size variations is discussed.

AUTHOR INDEX TO FORTY-SEVENTH ANNUAL PROGRAM

Note: The letters in parentheses indicate the Session or Division in which the author is listed; the page number follows. Letters in parentheses are as follows: (D) Design Division, (E) Enamel Division, (G) Glass Division, (ME) Materials and Equipment Division, (R) Refractories Division, (SCP) Structural Clay Products Division, and (W) White Wares Division; the General Session papers on Postwar Problems are indicated by (PW).

Amberg, C. R. (R 3), p. 103.
Amberg, C. R., and McMahon, J. F. (SCP 7), p. 105.

Baldwin, W. J. See Wainer, Eugene.
Barber, I. J. (ME 2), p. 101.
Beinlich, A. W., Jr. See Pole, G. R.
Bishop, F. L., Jr. (G 12), p. 100.
Blackburn, A. R., and Loomis, G. A. (W 9), p. 106.
Blaha, Emil (ME 4), p. 101.
Blume, A. J. (PW 5), p. 95.
Brown, D. P., and Hess, Ralph, Jr. (R 5), p. 103.

Carter, H. D. See King, B. W., Jr.
Clark, C. B. (R 11), p. 104.
Clemmer, J. B. See Rampacek, Carl.
Clemmons, B. H. See Rampacek, Carl.
Cliffe, W. R. (R 9), p. 103.
Colbert, William. See Pincus, A. G.
Comstock, G. F. See Wainer, Eugene.
Cook, R. L. (E 6), (E 7), p. 97.
Cummings, C. E. (D 9), p. 96.
Curtis, W. F. (G 1), p. 99.
Cuthbert, F. L. See Grim, R. E.
Cutler, L. R. (SCP 10), p. 105.

Danielson, R. R. (W 4), p. 106.
Davis, H. M. See Zerfoss, Samuel.
Draker, H. C. See King, B. W., Jr.
Dressler, Philip (W 5), p. 106.

Eagle, J. E. (PW 6), p. 95.
Emerson, W. H. (ME 5), p. 101.
Everhart, J. O. (R 13), p. 104.
Everhart, J. O., and Lassettre, Marjorie (R 12), p. 104.

Fajans, K., and Kreidl, N. J. (G 2), p. 99.
Fellows, R. L. (E 12), p. 98.
Firth, F. G. (ME 14), p. 101.
Flannagan, A. M. (D 5), p. 96.
Ford, G. D. (ME 10), p. 101.
Frost, L. J. (E 11), p. 98.

Giampietro, Alexander (D 7), p. 96.
Gingold, J. (W 2), p. 106.
Gingold, J., and Hirsh, E. J. (W 3), p. 106.
Grim, R. E., and Cuthbert, F. L. (ME 15), p. 102.

Harrison, W. N. (E 8), p. 97.
Hausner, H. H., and Naporan, Angela (W 1), p. 106.
Henderson, F. C. (ME 6), p. 101.
Henderson, L. A. (SCP 4), p. 105.
Hepner, L. H. (ME 1), p. 101.
Herold, P. G. (R 8), p. 103.
Hess, Ralph, Jr. See Brown, D. P.
Hess, R. L., and Zerfoss, Samuel (R 2), p. 103.
Hirsh, E. J. See Gingold, J.
Holden, T. S. (PW 2), p. 95.

Isenhour, J. H. (SCP 6), p. 105.

Jamison, H. W. See Thielke, N. R.

Kautz, Karl (E 2), (E 3), p. 97.
King, B. W., Jr., Carter, H. D., and Draker, H. C. (E 13), p. 98.
King, R. M. (E 5), p. 97.
Knight, M. A. (G 13), p. 100.
Kocatopcu, S. S. (W 6), p. 106.
Kreidl, N. J. See Fajans, K.

Lassettre, Marjorie. See Everhart, J. O.
Lenz, V. W. (G 3), (G 4), p. 99.
Loomis, G. A. See Blackburn, A. R.
Lorimer, A. G. (SCP 8), p. 105.
Lyle, A. K. (G 5), p. 99.

Marbaker, E. E. (ME 16), p. 102.
Marquis, John. See Orlowski, H. J.
Martin, C. A. (SCP 9), p. 105.
McMahon, J. F. See Amberg, C. R.
Meacham, F. L. (PW 3), p. 95.
Metz, G. F. (ME 13), p. 101.
Moody, H. L. (D 4), p. 96.
Mueller, Hans (G 9), p. 100.

Naporan, Angela. See Hausner, H. H.
Newbury, F. D. (PW 1), p. 95.
Nobles, M. A. (SCP 1), p. 105.

STRUCTURAL CLAY PRODUCTS DIVISION PROGRAM

Chairman: R. L. Stone, Department of Ceramic Engineering, University of North Carolina, Raleigh, N. C.
Secretary: R. L. Ferguson, Yankee Hill Brick Manufacturing Company, Lincoln, Neb.

Program Committee

A. Curtis Jackson, Chairman, The Claycraft Company, Columbus 16, Ohio
H. L. Winburn, Niloak Potteries, Little Rock, Ark.
J. G. Seanor, The Bonnot Company, Canton 2, Ohio

1. X-Ray, Thermal, and Chemical Examination of Typical Texas Clays

By Melvin A. Nobles: University of Texas, Austin, Texas

2. New Developments in a Test for Efflorescence

By L. H. Washburn: New York State College of Ceramics, Alfred, N. Y.

Changes are described in the method of forming, in the composition, and in the pretreatment of Efflorwicks to improve their reliability for tests on the effloresceing tendencies of structural materials.

3. Increasing the Life of Brick and Tile Dies

By Phillip W. Tefft: The Claycraft Company, Columbus 16, Ohio

The design of all-steel welded dies is discussed. By the utilization of hard-metal liners and a method for resurfacing them, liners can be used for months without renewal.

4. Grinding Problems

By L. A. Henderson: W. A. Riddell Corporation, Bucyrus, Ohio

A discussion is presented on using the proper machine to grind different types of materials.

5. Progress in Tunnel-Kiln Design

By James T. Robson: Allied Engineering Company, 4150 E. 56th St., Cleveland 5, Ohio

6. Efficient Operation of Tunnel Kilns

By John H. Isenhour: Isenhour Brick and Tile Company, Salisbury, N. C.

By making minor changes and adjustments, a tunnel kiln can be made to operate at a maximum capacity with less fuel and thereby increase efficiency of operation.

7. Testing of New York State Building for Resistance to Freezing

By C. R. Amberg and J. F. McMahon: New York State College of Ceramics, Alfred, N. Y.

This paper reports the results of testing stiff-mud shale and soft-mud clay brick of predetermined absorptions and saturation coefficients by the A.S.T.M. freezing test. A progress report is made on the natural exposure tests by which correlation between the laboratory freezing test and service results is being sought.

Symposium—Discussion of Structural Clay Products

8. An Architect Looks at Structural Clay Products

By A. Gordon Lorimer: Bureau of Architecture, Department of Public Works, New York, N. Y.

An architect discusses structural clay products, with emphasis on dimensional coordination.

9. A Contractor Looks at Structural Clay Products

By Charles A. Martin: Martin Fireproofing Company, Sidway Building, Buffalo, N. Y.

Structural clay products are discussed by the men who use them in construction.

10. Manufacturer-Dealer Relationships in the Structural Clay Products Industry

By Lloyd R. Cutler: The Entwisle Corporation, New York 17, N. Y.

A clay products dealer discusses better manufacturer-dealer relationships and presents some ideas visualized as possibilities in the clay products field.

AUTHOR INDEX (concluded)

Orlowski, H. J., and Marquis, John (W 8), p. 106.

Pence, F. K. (R 6), p. 103.
Pincus, A. G., and Colbert, William (G 6), (G 7), p. 99.
Pole, G. R., and Beinlich, A. W., Jr. (R 4), p. 103.
Powell, H. E., and Preston, F. W. (G 14), p. 100.
Powell, R. E. (G 8), p. 100.
Preston, F. W. See Powell, H. E.

Rampacek, Carl, Clemmons, B. H., and Clemmer, J. B. (ME 11), p. 101.
Redfield, R. C. (R 7), p. 103.
Rhodes, Daniel (D 3), p. 96.
Robinson, M. R. (ME 8), p. 101.
Robson, J. T. (SCP 5), p. 105.
Russell, Ralston, Jr. See Thorington, Luke.

Scholes, S. R. (G 10), p. 100.
Schweitzer, H. V. (ME 7), p. 101.
Silverman, Alexander. See Thorington, Luke.
Stout, R. H. (PW 4), p. 95.
Svec, J. J. (D 1), p. 96.
Swift, H. R. (E 1), p. 97.

Tefft, P. W. (SCP 3), p. 105.
Tesmer, W. H. (ME 3), p. 101.
Thielke, N. R., and Jamison, H. W. (ME 12), p. 101.
Thorington, Luke, Russell, Ralston, Jr., and Silverman, Alexander (G 11), p. 100.
Thurn, H. L. (D 2), p. 96.

Voorhies, J. H. (D 6), p. 96.

Wainer, Eugene, and Baldwin, W. J. (E 10), p. 98.
Wainer, Eugene, and Comstock, G. F. (E 9), p. 98.
Washburn, L. H. (SCP 2), p. 105.
Weldon, W. A. (D 8), p. 96.
Whittemore, J. W. (W 7), p. 106.
Williams, W. E. (ME 9), p. 101.
Willis, J. B. (E 4), p. 97.
Witschey, R. A. (R 10), p. 104.

Zerfoss, Samuel, and Davis, H. M. (R 1), p. 103.
Zerfoss, Samuel. See Hess, R. L.

WHITEWARES DIVISION PROGRAM

Chairman: J. W. Whittemore, Department of Ceramic Engineering, Virginia Polytechnic Institute, Blacksburg, Va.
Secretary: C. M. Lambe, Jr., U. S. Gypsum Company, Pittsburgh, Pa.

Program Committee Chairman
E. P. McNamara, Pfaltzgraff Pottery Company, York, Pa.

1. Shrinkage of Extruded Steatite Tubes

By H. H. Hausner and Angela Naporan: General Ceramics & Steatite Corporation, Keasbey, N. J.

Extruded steatite tubes shrink in a peculiar way. Sometimes the inside diameter shrinks more than the outside and in some cases the outside shrinks more than the inside. Very rarely do both diameters shrink in the same manner. The shrinkage of tubes was studied for the purpose of determining where there are laws governing the shrinkage of extruded materials. The authors conclude that the pressure distribution during the extrusion process plays a major role in the shrinkage of the tubes and some pressure distribution will essentially affect their shrinkage.

2. Mechanical Abnormalities of Ceramic Materials

By J. Gingold: General Ceramics & Steatite Corporation, Keasbey, N. J.

The flexural strength of ceramic materials, depending on diameter and edge distance, is investigated. Studies on tubes with a constant outside diameter have been made. These investigations show that strength figures obtained per unit area depend on the inner diameter. An attempt is made to explain these abnormalities.

3. Influence of Glaze on Strength of Steatite Tubes and New Method of Determining Glaze Stresses

By J. Gingold and E. J. Hirsh: General Ceramics & Steatite Corporation, Keasbey, N. J.

Different glazes have been applied on steatite tubes and the influence on impact and flexural strength has been determined. Glazes applied on tubes with very thin walls influence the thermal expansion of the ceramic body. This fact has been used to measure the glaze fit.

4. Influence of Composition on Properties of Cone 11 Zircon Glazes

By R. R. Danielson: Metal & Thermit Corporation, Carteret, N. J.

Studies have been made on the influence of various fluxing compounds on the glass and opacity of zircon glazes for one-fire ware at cone 11.

5. Recuperation in Direct-Fired Tunnel Kilns

By Philip Dressler: Swindell-Dressler Corporation, Pittsburgh 30, Pa.

The economy of recuperative firing using combustion air preheated by the cooling ware largely results from making more B.t.u. available at the maximum temperature reached in the furnace zone. The higher the firing temperature, the greater the benefit. The development of recuperative direct-fired tunnel kilns is reviewed.

6. Fundamental Properties of Clay: VII, Effect of Grain-Size Control on Properties of Casting Slip

By Sahap S. Kocatopcu: Department of Metallurgy, Massachusetts Institute of Technology, Cambridge 39, Mass.

Ternary mixtures were made of 0.2 to 0.4 μ and 0.8 to 1.6 μ-size fractions of clay and 16 to 44 μ-size flint after the removal of carbon and electrodialysis. For each composition, the specific gravity, base exchange, and pH of the slips were determined in order to obtain the same apparent viscosity. Small cylinders were obtained by solid casting. Shrinkage, porosity, and modulus of rupture of the dried cylinders were measured. With control of particle size, the closest packed system was obtained. Casting slips with the specific gravity of 1.95 and bodies with negligible drying shrinkage resulted by using a larger amount of flint. When compared with a standard sanitary body, the ternary composition giving the closest packing provided a higher specific gravity slip, with a cast of less drying shrinkage, lower porosity, and the same modulus of rupture.

It may be concluded that the control of particle size is essential for obtaining any desired variation in the properties of casting slips and cast bodies.

7. Binders, Lubricants, and Plasticizers for Ceramic Use

By John W. Whittemore: Virginia Polytechnic Institute, Blacksburg, Va.

A report is given of a questionnaire sent to manufacturers on this subject.

8. Lead Replacements in Dinnerware Glazes

By H. J. Orlowski and John Marquis: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

Data are presented on leadless glazes in which barium, fluorine, lithium, and strontium have been employed as fluxes. Molecular and batch formulas are given for the best glazes with the test results from plant trials conducted in six vitreous and semivitreous dinnerware plants. The glazes were developed for practical plant production as to cost of preparation, ease of application, and length of firing range. Tests include autoclave, thermal shock, impact, chipping, modulus of rupture, glazed-ring compression, and scratch hardness.

9. Use of Soda Feldspar in Whiteware Bodies

By A. R. Blackburn and G. A. Loomis: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

This paper covers a laboratory and plant-trial study of the use of soda feldspar as a complete replacement of the normal potash feldspar in whiteware bodies.

AUTHOR INDEX—PAGES 104–105

LOCAL SECTIONS

NORTHERN OHIO SECTION

The Northern Ohio Section of The American Ceramic Society was greatly honored by having as guests the members of the Central District Enamelers' Club at a joint meeting on February 1 at the Cleveland Engineering Society.

After an excellent turkey dinner with trimmin's, the meeting was called to order at 8:00 P.M. by the Chairman of the Northern Ohio Section. A report of the proceedings of the Executive Committee meeting on January 15 was read by Secretary Stephen M. Swain. The Section adopted by voice vote the Local Section Rules as published in the January, 1945, issue of *The Bulletin of The American Ceramic Society*. It was also announced that the Executive Committee established Local Section dues at one dollar for the calendar year 1945; and nonmembers of The American Ceramic Society, in accordance with the Local Section Rules, may become Associate Members of the Northern Ohio Section by the payment of Local Section dues and will also receive *Cleveland Engineering*, the weekly magazine published by the Cleveland Technical Societies Council.

The Technical Session program, arranged by Benjamin J. Sweo, was ably conducted by J. Edward Hansen, who first introduced the officers of the Central District Enamelers' Club, President Norman H. Stolte and Secretary Burton Longwell, for brief remarks. Mr. Stolte suggested that similar joint meetings should be planned annually in the future, with programs of interest to both groups.

An extremely interesting discussion on "Processing and Product Control Methods" was presented by C. L. Van Derau, Works Manager, and R. F. Bisbee, Manager of Quality Control, Westinghouse Electric & Mfg. Co., Mansfield, Ohio, with particular reference to the vitreous enamel products such as electric-range bodies and refrigerator boxes manufactured in normal times at this plant, whose 6000 workers have been producing during the past four years only such munitions as binoculars, range instruments, and aircraft sections. Methods of processing and control were described which were successful in reducing damaged and rejected range bodies from 18% to less than 1%, with a resultant saving of hundreds of thousands of dollars annually.

The next meeting of the Northern Ohio Section will be held Thursday evening, April 5, with Raymond E. Birch, Assistant Director of Research, Harbison-Walker Refractories Co., Pittsburgh, Pa., whose subject will be "The Industrial Revolution in Brickmaking."

—EDWARD M. SARRAF, *Chairman*

UPSTATE NEW YORK SECTION

The Upstate New York Section of The American Ceramic Society met February 2, 1945, at the Red Coach Inn, Niagara Falls, N. Y., with seventy-two attending. After a very enjoyable dinner, Chairman Berns called upon George Easter, President of the Ceramic Association of New York, and Gordon Keith, Secretary of the Canadian Ceramic Society, for a few words. President Fritz then commented on the splendid spirit prevailing at these meetings, bad weather notwithstanding, and stressed the importance of such gatherings and the educational possibilities to be attained. He went on to describe the activities of the parent Society and the services rendered by the Columbus office.

C. R. Amberg of the Committee on Rules reported on the revisions of the Rules as set up at the Rochester meeting. These Rules were unanimously adopted by the members present.

The speaker of the evening, S. F. Arnold, production engineer of the National Carbon Co., Niagara Falls, N. Y., gave a comprehensive address on "The What and How of Good Organization." This talk was a condensation of a forty-eight hour course given at Niagara University for the benefit of managerial personnel. Being a condensation in itself, it is difficult to do it justice with a short written report. Several of his definitions and direct statements were very meaty and deserve comment.

"Management is the unseen force which drives all that is physical within a plant. System is the mechanism of management functioning within an organization. No one can overstate the importance of a sound organization structure and of correct organization practice. Sound organization is essential to the handling of any phase of management that involves numbers of people. The lubricant to the wheels of organization is effective leadership."

The point which the speaker used to sum up his remarks demonstrates the ultimate aim of good organization. "Decisions should be made at the lowest level within the organization where the facts are available and competence exists to decide."

The next meeting of the Section is scheduled for March 23, 1945, in Buffalo.

—E. E. KUNZMAN, *Secretary-Treasurer*

PITTSBURGH SECTION

Winter Meetings

The February meeting of the Pittsburgh Section was held February 13, 1945. A dinner preceding the meeting was initiated and was acclaimed a success by the thirty-eight in attendance at the dinner at the University Club. Our guest and National President, E. H. Fritz, explained the cancellation of the Annual Meeting and stressed the importance of the Local Sections and the need for technical papers.

Following the dinner, the meeting was called to order at Mellon Institute under the direction of Harold E. Simpson, Chairman, with an attendance of about fifty-five. E. H. Fritz, vice-president of the Stupakoff Ceramic & Mfg. Co., Latrobe, Pa., discussed "Steatite Porcelain." His very excellent talk was nontechnical and in terms that could be easily understood by everyone. He described the composition of steatite porcelain and the methods used in manufacture as well as the properties of the material. He also pointed out the manufacturing problems and analyzed the future of the steatite industry.

Following his talk and a question-and-answer period, a U. S. Army film, "Substitution and Conversion," was shown, which depicted the changes made in Army and Navy supplies to eliminate critical materials. Although not pertaining too much to ceramics, the picture was enjoyed by all.

The March meeting of the Section was held March 13 at Mellon Institute. The speaker was George J. Bair of the Corning Glass Works, Corning, N. Y. A more detailed account of this meeting will appear in a later issue of *The Bulletin*.

Spring Meetings

The April meeting of the Section is set tentatively for April 10. The May meeting, to be held May 11, will be a dinner meeting for the ladies with the following Committee in charge: A. A. Wells, *Chairman*, N. S. Garbisch, W. Keith McAfee, and F. C. Flint.

—HOWARD M. PARKHURST, *Secretary*

MICHIGAN SECTION

A joint meeting of the Michigan Section and the Engineering Society of Detroit will be held in Detroit April 11, 1945. The speaker will be R. A. Weaver, President of the Ferro Enamel Corp., Cleveland, Ohio.

—J. F. QUIRK, *Chairman*

Keeping Abreast in 1945

Every year several hundred persons who are not members of The American Ceramic Society attend the Annual Meeting. They are interested in the ceramic industry and in the members of The Society, but they have never been persuaded to join.

This year they will be denied the pleasure of associating with you because of the wartime restrictions on conventions. If they want to learn of the scientific work which you have done, they must read *The Journal*. If they want to know of the improvements that you have made in plant operations, or the new developments in processing, they must read *The Bulletin*. More than ever they will need *Ceramic Abstracts* to keep abreast of the progress of the industry.

You know several men like this who would appreciate your help. Send them a personal letter today and enclose a membership application. We have printed enough copies of the January and February publications for them.

PAID MEMBERSHIP AND SUBSCRIPTION RECORD

Date of Record	Members Paid		Deferred	Subscriptions	Monthly Sales	Total Circulation
	Personal	Corporation				
February 21, 1944	2147	330	4	540	220	3241
December 21, 1944	2317	402	2	661	220	3602
January 21, 1945	2368	404	3	670	220	3665
February 21, 1945	2409	408	2	688	220	3727
12-month % increase	12.2	23.6		27.4		15

NEW MEMBERS IN FEBRUARY

Corporation

REPUBLIC STAMPING & ENAMELING CO., P. A. Mallonn (voter), Box 471, Canton 1, Ohio.
* STRONG MFG. CO., W. U. Pfaeffli (voter), Sebring, Ohio.
THERMO FIRE BRICK CO., Howard Hicks (voter), Box 277, Sulphur Springs, Texas.

Personal

ACHATZ, CLIFFORD F., 1417 Pacific Ave., Brackenridge, Pa.; research engineer, Pittsburgh Plate Glass Co.
BEATHARD, ROBERT K., General Tile Corp., Box 38, El Segundo, Calif. (formerly in name of R. F. Falconer).
BERNARDINI, GUY F., 425 Main St., Latrobe, Pa.; Stupakoff Ceramic & Mfg. Co.
BROWNE, JOHN E., 195 Wayne Dr., Motor Route 1, New Kensington, Pa.; research engineer, Pittsburgh Plate Glass Co.
BUCHHOLZ, LT. (JG) EDWARD R., 1650 East Ave., Rochester 10, N. Y.; U. S. Navy.
BURDICK, SIDNEY D., 6 Belleau St., Corning, N. Y.; Corning Glass Works.
ENDLER, A. H., 125 Avenue C, Battle Creek, Mich.
GILL, EDGAR C., Box 237, Gordon, Ga.; chief chemist, Moore & Munger.
*GLICK, WENDELL A., Perfection Stove Co., 7609 Platt Ave., Cleveland 4, Ohio.
GREDYS, DANIEL N., Perfection Stove Co., 7609 Platt Ave., Cleveland 4, Ohio.
GRIMISON, E. DOUGLAS, Babcock & Wilcox Co., Refractories Division, Bayonne, N. J.; development superintendent.
HELLMAN, ERIC, 34 W. Tulane Rd., Apt. D, Columbus 2, Ohio; Ceramic Department, Battelle Memorial Institute.
KALOUSEK, GEORGE L., 2063 Brookdale Rd., Toledo 6, Ohio; physical chemist, Owens-Illinois Glass Co.
LANGROD, KASIMIR, 44 Kensington St., New Haven, Conn.; chemist.
MONTGOMERY, WILLIAM A., John Inglis Co., Ltd., 14 Strachan Ave., Toronto, Ontario, Canada; metallurgical engineer.
NELSON, ENS. FORREST W., 135 Washington St., Brighton 35, Mass.; Ingram-Richardson Mfg. Co. of Indiana, Inc.
OERTEL, PAUL J., Owens-Illinois Glass Co., 601 36th Ave., Oakland, Calif.; supervisor, Batch and Furnace Department.
PREY, ARTHUR H., Carborundum Co., Niagara Falls, N. Y.; manager of Ceramic Technical Division.
RAINWATER, CHARLES, P. R. Mallory & Co., 3029 E. Washington St., Indianapolis, Ind.; field engineer.
SALSICH, NEIL E., 296 N. Columbia Ave., Columbus 9, Ohio; vice-president, Jeffrey Mfg. Co.
SANDMEYER, KARL H., 1618 Tenth St., Niagara Falls, N. Y.; research engineer, Carborundum Co.
SHAW, DOUGLAS M., 328 W. Palm St., Monrovia, Calif.; Pacific Clay Products.
STAUFFER, S. WALTER, National Lime Assn., 927 Fifteenth St., N. W., Washington 5, D. C.; president and general manager (formerly in name of W. Vernon Brumbaugh).
STOREY, HAROLD H., Box 1587, Nairobi, Kenya Colony, East Africa; East African Industrial Research Board.
VAN ZEE, ARTHUR F., 3430 Inverness Ave., Toledo 7, Ohio; Owens-Illinois Glass Co.
WILLIAMS, H. T., R. Thomas & Sons Co., Lisbon, Ohio (formerly in name of A. G. Mason).
ZIMMER, KAREL, 210 Academy St., Trenton 8, N. J.; ceramic engineer.

Student

Cleveland School of Art: HILDEGARD CHEGIN.
University of Illinois: WILLIAM J. MEID.
University of Toronto: DAVID WRIGHT.
Virginia Polytechnic Institute: LUTHER E. PLEASANTS, JR.

(1945)

MEMBERSHIP WORKERS' RECORD

CORPORATION: C. A. Freeman 1, F. A. Petersen 2.
PERSONAL: A. I. Andrews 2, J. L. Austin 1, U. E. Bowes 1, Leslie Brown 1, O. K. Etheredge 1, C. E. Fulton 2, H. H. Holscher 1, A. M. Kohler 1, R. E. Long 1, A. O. Pieper 1, J. C. Sutherland 1, J. A. Thomas 1, R. W. Wilson 1, Office 12.
STUDENT: R. L. Cook 1, Mrs. A. R. Dyer 1, R. J. Montgomery 1, J. W. Whittemore 1.
GRAND TOTAL: 34.

ROSTER CHANGES IN FEBRUARY†

Personal

BROUK, LT. (JG) J. JOHN, Naval Research Lab., Anacostia Sta., Washington 20, D. C. (St. Louis, Mo.)
BURNHAM, FORREST E., Wesleyan School of Fine Arts, Macon, Ga. (Alfred, N. Y.)
CRANE, ROBERT F., 505 Glendale Blvd., Parchment, Mich. (Kittanning, Pa.)
CURTIS, CARL E., Titanium Alloy Mfg. Co., Niagara Falls, N. Y. (Derby, Conn.)
DORAN, ROBERT F., 23 Cunningham Ave., Floral Park, Long Island, N. Y. (Emporium, Pa.)
GOIN, LT.(JG) FRED L., Camp Bradford, Norfolk 11, Va. (Oakland, Calif.)
HOSTETTER, JOHN R., 4544 S. Chelsea Lane, Bethesda 14, Md. (Huntington, W. Va.)
LEWIS, GORDON E., 43 West 45th St., Corning, N. Y. (West Reading, Pa.)
MANSON, M. E., Box 1480, Palm Springs, Calif. (Los Angeles, Calif.)
MCCOLLOM, PERRY C., 95 Myrtle St., Shelton, Conn. (New Castle, Pa.)
MCCUTCHEN, EARL S., Art Dept., University of Georgia, Athens, Ga. (Columbus, Ohio)
MESSIMER, LAVERNE A., Holophane Company, Newark, Ohio (Washington, D. C.)
MEYER, HERBERT T., 8090 Carlin, Detroit 27, Mich. (Kankakee, Ill.)
MOFFAT, JOHN, JR., 930 Stewart and Gray Rd., Downey, Calif. (Huntington Park, Calif.)
MORROW, C. T., 701 Kearney Ave., Cape May, N. J. (Pittsburgh, Pa.)
ROWLAND, DAVIDGE H., Porcelain Insulator Co., Lima, N. Y. (Sewickley, Pa.)
UTTER, JOSEPH L., 1888 Bay Rd., R.D., North Easton, Mass. (Cambridge, Mass.)
WARD, GEORGE W., Midwest Research Institute, 4049 Pennsylvania, Kansas City, Mo. (Chicago, Ill.)
WHITTAKER, HARRY, Koebel Diamond Tool Co., 9456 Grinnell Ave., Detroit 13, Mich. (Chicago, Ill.)
WURTSBAUGH, C. G., 6801 Stafford Ave., Huntington Park, Calif. (Los Angeles, Calif.)
ZINSZER, WILLIAM K., R. D. 1, Box 929, Pittsburg, Calif. (Palo Alto, Calif.)

* Indicates former member of The Society rejoining.
† Address in parentheses is former address.

GROW BY GETTING MORE NEW MEMBERS TO JOIN THE SOCIETY

MEMBERS IN SERVICE*

The following members of this Society are in fighting units of war service. There are several in service in Washington not included in this Service Roster. This list, which was begun September, 1942, and added to each succeeding month, is probably not complete, and we would appreciate information on other members.

(413) EDWARD R. BUCHHOLZ, Pittsburgh Plate Glass Co., Pittsburgh, Pa.
(414) ROBERT F. CRANE, Eljer Company, Ford City, Pa.
(415) FRED KAPLOWITZ, New York State College of Ceramics, Alfred, N. Y.
(416) H. HENRY NAKAMURA, New York State College of Ceramics, Alfred, N. Y.
(417) J. B. NAPIER, Cherokee Brick Co., Macon, Ga.
(418) FORREST W. NELSON, Ingram-Richardson Mfg. Co. of Indiana, Inc., Frankfort, Ind.
(419) GERALD F. RYNDERS, New York State College of Ceramics, Alfred, N. Y.

* These are in addition to the lists published monthly, beginning with the September, 1942, *Bulletin*, with the exception of the June, 1943, issue.

LETTERS FROM SERVICEMEN

Cumberland, Md.,
5 January, 1945

Dear Ross:

During the past several months, I have been receiving your letters entitled "Ceramics for the Serviceman" and have enjoyed each and every one of them immensely. Of course, it goes without saying that the publications have been coming in as regular as a clock. Many thanks for your interest in getting them to me.

My assignment here has proved to be one of the most interesting experiences of my life; however, as you may readily understand, I'm still partial to the ceramic field. For this reason, I should like to be advised as to whether or not there are any Section meetings of The Society in the vicinity of Cumberland. Frequently, I'm hard pressed for time, but during my off moments there is nothing else that I would rather do than attend a good confab.

It would be wishful thinking on my part to say that I'll be at the Annual Meeting in April; however, you can be certain that every effort will be made on my part to attend. In the meantime, best wishes for the New Year and

Regards,
WILLIAM F. WINEMILLER,
First Lieutenant, Ordnance Department

★

San Francisco, Calif.,
7 January, 1945

Dear Dr. Purdy:

We are two naval officers stuck out here in God-forsaken spots far from any reference books and other sources of information.

We heard, in a vague sort of way, about the field of ceramics, and what little we know has aroused our interest. It would be appreciated if you would supply us with information on the following points:

(1) Generally what does the field of ceramics cover?
(2) Schools for study with your recommendations of the best.
(3) Type of work ceramic engineers begin with and who they generally work for.
(4) Average pay of ceramic engineers.
(5) Demand for ceramic engineers in the United States and elsewhere.
(6) The future of ceramic engineering.

If, in sending us the above information, any expense is involved, please let us know so we can reimburse accordingly.

Thank you very much. We remain

Respectfully,
G. R. WILLIAMS AND S. H. SADOFF,
Lieutenants (j.g.), U. S. Navy

New York, N. Y.,
7 January, 1945

Dear Ross:

I've gotten so much mail from you that I haven't answered that I feel kind of meek about coming through now. I really appreciated the Xmas card from you and the staff.

At present I'm sweating out a few more missions before completing my tour of duty over here. It shouldn't take too long for the number I have to go.

It has been a long time since I've done anything that hinted of being of a ceramic nature. Two and a half years in the Army really carves up what I thought was going to be a career.

Not much news from this part of the world these days. I'm looking forward to getting back to work real soon—work of my own choice.

Sincerely,
JOHN T. SMITH,
Technical Sergeant, Army Air Forces

★

San Francisco, Calif.,
9 January, 1945

Dear Ross and Company:

Just received your letters of 27 October and 17 November. I've been moving a bit, so they took a while to catch up with me.

I've come back here to Hawaii for a short schooling. It's kinda rough studying again, but I guess I'll survive. Best wishes for you all in 1945.

Sincerely,
R. H. Dows,
Lieutenant, Army Air Forces

★

New York, N. Y.,
3 January, 1945

Gentlemen:

I am serving overseas but expect to return to the States fairly soon. I would appreciate addresses of firms who produce ceramics for use in baths in the vicinity of Greenfield, Mass., or as near thereto as possible.

Yours sincerely,
WILLIAM ROBERTS,
Major, U. S. Army

★

New York, N. Y.,
3 January, 1945

Gentlemen:

I have been very much pleased to receive your letters to ceramists in the services.

Over here in France it is very easy to lose track of those persons and things in which one was interested while still

a civilian. The letters from The Society are a most welcome link to those old interests and to those things which one expects will preoccupy him in the days of peace to come.

To facilitate delivery of any future correspondence, I submit my military address. I also wish to submit the address of James R. Tinklepaugh, a personal friend and fellow graduate of the New York State College of Ceramics, Class of '43. Private Tinklepaugh is also in France and, at last advice, was located not far from my present location. Circumstances have so far prevented any contact except through the mail, but I feel certain that he will approve my action in forwarding what is, to the best of my knowledge, his most recent address.

Sincerely yours,
GEORGE A. JONES,
Second Lieutenant, Army Air Forces

★

Fort Leavenworth, Kans.,
17 December, 1944

Dear Sirs:

I only wish that I felt free to renew my subscription and membership for 1945. My position thus far has been a very fortunate one—I have been in this country for over four years. Despite that fact, I have not had sufficient time to read what copies of *The Journal* and *The Bulletin* I received while an active member. I am now here, temporarily, receiving training for an overseas assignment, and if I do go over I *know* I will not have the time to spend keeping abreast of the ceramic field.

No one ever disliked making such a statement as I, and no one ever bemoaned the fact that he is unable to keep up with the field as I. I am not so fortunate as many others inasmuch as I have no job in ceramics to which I can return. Nevertheless, do not worry about my not being able to make the readjustment. Perhaps a little refreshing of the details may be necessary, but the readjusting can take care of itself if only I can get back to ceramics.

However, please do not take me off your mailing list.

CHARLES W. PIEZ, JR.,
Major, Ordnance Department

★

Fort Bliss, Texas,
15 January, 1945

Gentlemen:

Enclosed is a check to pay my dues to The American Ceramic Society for 1945. In a way it is a pleasure to pay this, for when I entered the Army two and one-half years ago I didn't know whether or not I would be "present" to pay it. As it has been so far (through no fault of my own), I have not been in combat, have not been overseas, and my life has not been much more warlike than when I was in the brick plant back in Ohio.

If you have the December issues of *The Journal* and *Bulletin* for 1944 and 1943 for sale, I would like to buy a copy of them. I presume it is those issues that carry the Indexes.

Sincerely yours,
J. T. SELLERS,
Warrant Officer, U. S. Army

★

San Francisco, Calif.,
30 January, 1945

Dear Ross:

I'm at sea again aboard this swell cruiser, so please change your address records accordingly, but keep *The Bulletin, Journal*, etc., going to Milltown.

It's swell to read your News Letters and other good dope you put out to your members. It's most comforting to know that The Society and ceramics are doing such a grand job in this war period and that we in the service have much to look forward to in our chosen profession when we return.

Kindest regards,
JOHN R. KAUFFMAN,
Lieutenant, U. S. Naval Reserves

San Francisco, Calif.,
20 January, 1945

Dear Sir:

I am writing you to let you know that I have been receiving your letters and to give you my new address. I certainly enjoy your letters.

DONALD R. SMITH,
ML Third Class, U. S. Navy

★

New York, N. Y.,
2 February, 1945

Dear Dr. Purdy:

It has been good to receive copies of *The Journal* and *Bulletin*, as well as your letters to "Ceramists in the Service." While being out of the States for a year, any literature from the A.C.S. is very helpful for keeping in touch with your former ceramic field.

I am not permitted to say where I've been stationed, but I can say my duty during the last year has been in the South American area. I have been very fortunate in being able to visit some prominent cities and visit some ceramic plants, having so far spent some days in Rio de Janeiro, Montevideo, and Buenos Aires. While visiting Rio, I was very pleased to "get together" with Eric R. Falcão, who recently spent a year at the New York State College of Ceramics, Alfred, N. Y., and another year at Niles and Cleveland, Ohio. Eric is connected with the General Electric Company in Rio, and I spent an interesting day at the glass plant and lamp plant in Rio. Eric was a little surprised to see me, and we decided that war had a few good points in travel for a few people—though nothing else could be said for it. The brick and tile industries in many parts of South America seem to be run on a very primitive basis, producing brick and tile of a soft sort; I understand, however, that many modern plants are found at São Paulo, Brazil, and especially in refractories. It is said that high-grade refractory raw materials are being discovered. Many modern cement plants are seen in traveling near the larger cities. It appears that the ceramic industry has a great future in this country.

The Annual Meeting in Buffalo sounds good, and I hope it is very successful. Thank you for your letters.

Sincerely,
WILLIAM J. KNAPP,
Lieutenant (j.g.), U. S. Naval Reserves

★

South Pacific,
19 January, 1945

Dear Dr. Ross Purdy:

Your "Ceramists in the Service" has been reaching me promptly and I have enjoyed it so very much.

This circular letter does a great deal in keeping one's vocation in working condition. We in the service are having our hands full keeping up with Navy data, but the condensed manner of your letter makes interesting and educational reading.

I have been attached to this ship only temporarily, so if you use my address that is on your files, my office will forward your mail to me.

Thanks again for your thoughtful service.

Yours very truly,
C. A. SANDERS,
Ensign, U. S. Navy

★

San Francisco, Calif.,
28 January, 1945

Dear Friends:

Many thanks for your Christmas card. I was mighty happy to hear from you and to read in your recent letter of the advancements in ceramics.

Although I am far removed from work in the field, these new places suggest possibilities for ceramic investigation and development.

With best regards,
R. H. BOLLINGER,
Ensign, U. S. Naval Reserves

South Pacific,
31 January, 1945

Dear Ross:

I intended writing you previously to thank you for the nice Christmas card. We all appreciate your thoughtfulness.

I must apologize for letting my membership dues lapse. At first I thought that being on the move out here quite a bit would make it difficult for *The Journals* to reach me. I have come to the conclusion now, though, that even if they may be late in reaching me at times, I'll still enjoy reading the latest developments in ceramics. I surely don't want to be forgotten, for as soon as I get back to civilian life, I'm starting right where I left off.

You will notice my change in address. We are still the same old outfit with a new name and under new administration.

We hardly ever come in contact with any ceramics out here but I've often wondered what kind of brick or refractory could be made of coral. There seems to be so much of it here and it's always in the way.

I trust you are enjoying good health. Regards to all.

Cordially yours,
JACK STEWART,
Lieutenant, U. S. Marine Corps

★

Wichita Falls, Texas,
5 February, 1945

Dear Sirs:

I greatly appreciate your sending me bulletins and reports of activities in the field of ceramics. Since I have been in the Army Air Forces it is one of the few means I have of keeping up with new developments.

Possibly you would like to know the opinion of a serviceman on your issue of whether to or not have the 47th Annual Meeting. I wholeheartedly agree with President Fritz that the Meeting should be held. Any meeting that will spread new and worth-while ideas in a vital industry is essential.

Sincerely,
KEITH F. WALKER,
Lieutenant, Army Air Forces

★

Corpus Christi, Texas,
7 February, 1945

Gentlemen:

I received your letter of January 23 and wish to express my appreciation for being kept on the active member list. As soon as I resume work in the engineering field and am able to establish a permanent address I intend to again participate in the affairs of The Society.

The service letter has been very interesting and I appreciate being among those to receive it.

Yours sincerely,
HAROLD F. WAGNER,
Seaman First Class, U. S. Navy

★

San Francisco, Calif.,
15 February, 1945

Dear Sirs:

Here it is the middle of February and I still have not received my bill for this year's dues. I imagine this is due to the fact that I have been moving around this globe considerably and that my mail is still chasing me. My address is more or less permanent now, however, and if you will send me the bill, I shall take care of it.

I would appreciate your informing the Institute of Ceramic Engineers also as I do not want my membership to expire in either organization.

I have appreciated the monthly letters although I have missed about four now. It sure is good to know there is still someone doing things back there.

Good luck to all of you.

Sincerely,
F. P. SHONKWILER,
Ensign, U. S. Naval Reserves

New York, N. Y.,
4 February, 1945

Dear Mother Purdy and Ross:

Enclosed is a copy of our *Weekly News*. Sort of incomplete news on account of security.

Well, someone got on the ball. No more plastic dishes are being supplied to ships now.

Don't think I will make the April Meeting. Will you have one?

My best wishes to all of you.

DICK CAROTHERS,
Lieutenant, U. S. Naval Reserves

NOTES

RESEARCH AND THE VITREOUS ENAMELLING INDUSTRY

G. H. Abbott, Ferro Enamels, Ltd., Wombourne, Wolverhampton, England, presented a paper entitled "Research and the Vitreous Enamelling Industry" at the annual meeting of the Institute of Vitreous Enamellers held November 24 and 25, 1944, in Manchester, England. He reviewed the history of the industry briefly and then discussed research especially during the last few years.

Mr. Abbott stated that American research methods and men have been responsible for the bulk of the technical development in this branch of the ceramic industry. The system of using university and industrial laboratories for research also contributes to this progress.

In 1938, the following enamel abstracts were published: British Ceramic Society 18, British Cast Iron Research Association 56, British Chemical Bureau 91, American Chemical Society 165, Deutsche Chemische Gesellschaft 165, and American Ceramic Society 359.

Mr. Abbott further attributed the growth of American research to a few men of "exceptional courage and vision" who have been attracted to the industry.

CERAMICENTER, INC.

The following letter was received in this office recently. For previous notices concerning the Ceramicenter, see *Bull. Amer. Ceram. Soc.*, **21** [7] 148 and [11] 301 (1942).

New York, N. Y.,
January 25, 1945

My dear Dr. Purdy:

Remembering with the greatest of pleasure your valued advice in your last letter to Ceramicenter, I thought it might interest you to know the progress we have made.

We have leased a building where we have on the premises a fine group of top-flight designers and sculptors, creating models not only for jobbers and wholesalers but for ceramic manufacturers.

Our aim is to promote the ceramic industry by acting as an intermediary between jobbers, wholesalers, and designers and sculptors and to recommend the factories that are particularly equipped to produce our models.

We are also working to find new outlets for ceramic artware by coordinating ceramic art with metal, wood, Lucite, and other materials. We are especially active in this field, as we have been solicited by foreign manufacturers eager for designs and models to be executed abroad and sold in America. We want to protect this market for American designers and American industry.

Our staff of designers and sculptors have the "know-how" to produce models in line with technical requirements, be it lamp bases, ceramic artware, or utilitarian items.

We are prepared to cooperate in any and all ways with the American ceramic industry.

Sincerely yours,
SYD LEE GORDON, *Director*,

PERSONAL NOTES

FRANK H. RIDDLE HEADS CHAMPION CERAMIC DIVISION

Frank H. Riddle has been elevated to the vice-presidency of the Champion Spark Plug Company and to the factory managership of its Ceramic Division at Detroit.

Mr. Riddle, who has been research director of the Ceramic Division, succeeds the late Joseph A. Jeffery. He has been a member of the Champion organization for twenty-five years and has been actively engaged in ceramics since 1902. He holds thirty-two United States and foreign patents, five jointly with other members of the Champion staff, and has written more than thirty technical articles for various scientific societies.

Mr. Riddle is a native of Colorado and a graduate of Ohio State University with the degree of ceramic engineer. In 1931, he was awarded the professional degree of ceramic engineer from that institution. During World War I, he engaged in experimental work with the National Bureau of Standards where he performed fundamental work on refractories and the development of synthetic sillimanite spark-plug insulators. This pioneer work was later amplified and carried through to a successful conclusion by Dr. Jeffery's discovery and introduction of natural sillimanite to the spark-plug industry (see the February, 1945, *Bulletin*, p. 84).

He is a member and Fellow of The American Ceramic Society, of which he was president in 1922. He also has served as Dean of Fellows. He likewise is a member of the Ohio State University Research Foundation and the Engineering Society of Detroit.

R. E. HALL

Dr. R. E. Hall, whose photograph appears in the opposite column, is director of Hall Laboratories, Pittsburgh, Pa. The laboratories are the center of a far-flung network of water chemistry which safeguards not only production of synthetic rubber for war at Kobuta, Pa., but hundreds of plants in the United States, Canada, and Mexico which produce everything from steel, tires, oil, and glass to foods, chemicals, trucks, and guns.

R. B. SOSMAN SPEAKS BEFORE CHEMICAL SOCIETY

A large group of members of The American Ceramic Society attended the January 24 meeting of the Toledo Section of the American Chemical Society to hear R. B. Sosman, Research Laboratories, U. S. Steel Corp., Kearny, N. J., discuss the subject "Oxides of Iron."

Dr. Sosman's subject matter was concerned mainly with two topics: (1) the polymorphism of iron and its oxides and (2) the phase equilibrium diagram of the iron–oxygen system. The equilibrium diagram is now, for the first time, satisfactorily complete, at least at oxygen pressures of one atmosphere and less.

The atomic structure of iron and oxygen and the crystalline structure of the metal and its oxides furnish a foundation for the systematic explanation (still incomplete) of the polymorphism that runs through all the crystalline phases. Some of the peculiar features are the magnetic inversions, the appearance of the same structure in two separate regions of temperature, the occurrence of a phase stable only at high temperature, and the existence of ferromagnetic and paramagnetic forms of the same composition. Analogous phenomena can be found in the hydrated oxides and in some of the other compounds of iron.

Dr. Sosman also considered briefly some applications of the facts to steelmaking and to geochemistry.

R. E. Hall

ORTON FOUNDATION

The Edward Orton, Jr., Ceramic Foundation has announced the appointment of Eldon G. Constans as ceramic engineer. Mr. Constans will be attached to the staff at the Foundation headquarters in Columbus, Ohio.

John L. Carruthers, manager of the Foundation, states that Mr. Constans will carry on research work in the further development of the use of standard pyrometric cones for the firing of ceramic ware. His appointment makes it possible for the Foundation to do some intensive research work at this time.

Mr. Constans was in the class of 1933 at Ohio State University in ceramic engineering. He has given much of his time to work in enamels and glass, as well as clay products. He was with the Westinghouse Electric and Manufacturing Company, the Newark Stove Company, and the Landers, Frary and Clark Company in the course of his employment. He left the Curtiss-Wright Corporation as a project coordinator in the Columbus plant to take over his new work.

Only the urgent need for pyrometric cones of high quality and standard temperature ratings by the electrical porcelain and refractories industries made it possible for the Foundation to secure Mr. Constans at this time. The War Manpower Commission has classed this work as A–1 essential owing to the usage of pyrometric cones in the war industries.

YOUR PERSONAL SOCIETY

The American Ceramic Society is of, for, and by ceramic persons and corporations. For forty-six years, their sole purpose has been promoting cooperatively their ceramic welfare.

By educational and research facilities promoted by them, ceramics in America has forged to leadership.

NECROLOGY

J. W. CRUIKSHANK DIES IN ENGLAND*

James Walter Cruikshank, founder and president of the J. W. Cruikshank Engineering Co., Pittsburgh, Pa., died December 30, 1944, at the home of his sister, Dr. Mary Carew-Hunt, Church Handborough, Oxford, England. About the middle of last December, Mr. Cruikshank suffered a stroke that affected his speech. From that time on, he also complained of a pain around his heart. During the night of December 28 he became seriously ill and died two days later.

James Walter Cruikshank

The deceased was born May 14, 1864, in London, England. He was the eldest son of Augustus Walter and Alethea Harriet Cruikshank of Langley Park, Montrose, Scotland, his family being an old Scottish landed gentry family. He was educated at Bristol University and came to the United States in the early nineties. He became an American citizen in 1896.

In 1897, Mr. Cruikshank joined the Pittsburgh Plate Glass Company, retiring from that Company about 1898 to establish himself in business as a consulting engineer in the plate-glass industry. During his engineering career in the plate-glass industry, he took a prominent part in the construction of the Allegheny Plate Glass Co., Glassmere, Pa.; the American Plate Glass Co., James City, Pa.; the Standard Plate Glass Co., Butler, Pa.; the Heidenkamp Plate Glass Co., Springdale, Pa.; the Edward Ford Plate Glass Co., Toledo, Ohio; and the Ottawa Plate Glass Co., Ottawa, Ill., as well as directing the engineering construction work in plate-glass works in Belgium. When he retired more than a decade ago, he had nearly one hundred patents on improvements in the plate-glass industry which were sold to Pilkingtons.

Mr. Cruikshank was a member of the Pittsburgh Rotary Club. He is survived by three children, James R. H. Cruikshank, Hollyburn, British Columbia; Robert G. Cruikshank, London, England; and Mrs. Helen M. Mace, Salisbury, Southern Rhodesia. He is also survived by one sister, Dr. Mary Carew-Hunt, and two brothers.

Mr. Cruikshank was at one time a member of The American Ceramic Society.

* Reprinted from *Nat. Glass Budget*, **60** [39] 3, 6 (January 27, 1945).

COLONEL HUGH S. BRADY

Colonel Hugh S. Brady, prominent in the glass industry before the war, died January 13, 1945, in Cumberland, Md.

Colonel Brady was born June 26, 1888, in Howardsville, Va. Following his public-school education, he was graduated from the Blackstone Military Academy, Blackstone, Va., was graduated from the Carnegie Institute of Technology, and took a postgraduate course at Lehigh University.

He was first employed by the Jones & Laughlin Steel Company. Soon after his entry into the glass industry, he was superintendent of the Wheeling plant of the Hazel-Atlas Glass Company and later was manager of the same Company in West Virginia. His last position in the glass industry was with the Jeannette Glass Company at Jeannette, Pa., as vice-president and general manager.

In September, 1942, he returned to United States service as Lieutenant Colonel in the Chemical Warfare Service at the Huntsville Arsenal, Huntsville, Ala., as Chief of S.I.L.D. Later, he became Assistant Chief of Operations. In August, 1944, he was transferred to the Edgewood Arsenal, Edgewood, Md.

Colonel Brady was a member of the American Society of Mechanical Engineers, the American Society of Military Engineers, the Society of Glass Technology (England), and The American Ceramic Society.

LT. CLAUDE N. KIMBALL, JR.

Word has been received that Lt. Claude N. Kimball, Jr., of Enfield, N. C., was killed in a plane crash over Puddletown, England, May 21, 1944.

Lieutenant Kimball, a student member of The American Ceramic Society, had attended the University of North Carolina before entering the service.

CLARK CAMPBELL TRUMAN

Clark Campbell Truman, only son of Mrs. Leslie Truman and the late Gail Truman, was killed in action in the European theater of war November 15, 1944. He was a member of the 379th Infantry of the 95th Division fighting near Metz.

Clark was inducted into service at Altoona, Pa., July 24, 1943, along with a number of classmates in the Brookville High School class of 1943. He was born January 25, 1925, thus being short of twenty years of age when he gave his life for his country.

He was a member of the National Honor Society, the Hi-Y Club, the Brookville High School rifle team, and was a senior patrol leader in the Boy Scouts.

No finer tribute can be paid to Clark than that contained in the following letter which was received by Mrs. Truman shortly after Clark's death.

Beechwoods Presbyterian Church,
December 8, 1944

Mrs. Gail Truman,
Brookville, Pa.

Dear Mrs. Truman:

For more than forty years I have been dealing with boys, all kinds of boys. I want to repeat what I have said many times before concerning your noble lad: "I have never dealt with a finer specimen of boyhood than Clark Truman. In all my years of association with him as scoutmaster, I never saw him do anything or heard him say anything that was not in strictest accord with the high standards of the Boy Scout organization and the teachings of the New Testament. Never did I hear him use a profane or vulgar word."

Clark was not only fine in his conduct but there was a *spirit* about him and the way he did and said things that was so different from that of many excellent boys. If you desire my full feeling as to the type of boy Clark was, read the Scout Laws and then say: "Clark was those laws in flesh and blood."

Mrs. Shoemaker and I send you our sincere sympathy and assure you of our earnest prayers for you in these dark hours. Now is the time when your Christian faith will help you. Since Clark was the boy he was, you can say a thousand times over, "Better to have had and lost, than never to have had at all." You will always have him with you as a blessed memory and, as years come and go, the holy memory will be like a living presence. Comfort yourself that he is not gone, only gone on.

As I look back upon my long Brookville pastorate, some of the most blessed memories are those in connection with

the Boy Scouts. I was not a good scoutmaster, for I did not know enough about scouting. I never had it in my boyhood days. I never could have acted as master had I not had the help of Clark Truman, Pat Hughes, Arnold Johns, and a few others of that type. Clark was our faithful and efficient scribe.

God bless you and may He use you to be a fine Christian mother to some other lad, who does not have the home influence that your laddie had. There is consolation in unselfish Christian service.

As ever your friend,
F. BENTON SHOEMAKER,
Clark's scoutmaster and friend

HOWARD ORLOWSKI MISSING OVER JAPAN*

George A. Bole, Engineering Experiment Station, recently received a letter from the parents of Second Lieutenant Howard J. Orlowski, '38, who has been missing in action since November 21.

As far as his parents know, he had been on two raids in a photo reconnaissance Superfortress. He was flight engineer on a B-29 based on Saipan.

The lieutenant's parents quoted a letter from his commanding officer which reads:

"Your son, Howard, was the flight engineer on a flight over the Japanese Empire. His crew had reached their destination, obtained the photographs they were instructed to take, and were on their way back to their Saipan base.

"Radio contact with the airplane indicated it was about 250 miles from the base. That was the last we heard from them. A very large storm area was in their path and we assume they were lost in that.

"Naval and air search units were immediately sent to the area and after thirty days of searching no trace of the missing plane or crew has been found.

"It is with the utmost regret that we must conclude that Howard and his crewmates are lost. I would like to say to you that your son was a fine officer.

"He was respected by his men and his fellow officers as a man who knew his job and did it well. I am proud to have known him and served with him."

* Reprinted from *The Ohio State University Lantern*, February 15, 1945.

"Ozzy" had been a member of The American Ceramic Society since 1939 and had served as chairman of the Central Ohio Section. He came to see us often when he was engaged as research engineer at the Ohio State University Engineering Experiment Station. It is hard to believe that he is gone.

CERAMIC NOTES

SEARLES LAKE BECOMES MAJOR LITHIUM SOURCE

Searles Lake, located on the edge of the Mojave Desert near the northwest corner of San Bernardino County, Calif., has long been a source of borax, potash, soda ash, sodium sulfate, bromine, and other chemicals. Only recently, however, has it been exploited for its lithium values. Previously, all lithium compounds were produced from various complex lithium ores, but since 1938 the production of lithium compounds in the United States has been substantially increased by the entry of the American Potash & Chemical Corporation of Trona, Calif., into the ranks of primary lithium salt producers.

Searles Lake is in reality a desert salt pan. For the most part, the "lake" consists of a solid body of crystalline salts extending to a depth of from 60 to 90 feet. It covers approximately 12 square miles and contains possibly 100,000,000 tons of alkali salts per square mile.

The porosity or proportion of voids in the salt body has been variously estimated at 25 to 45%. These voids are filled with a saturated brine. Wells drilled into the deposit extract this brine at the rate of about 17,500 tons per day as raw material for the production of the various chemicals produced at the Trona plant. Thus, Searles Lake constitutes one of the country's greatest single stock piles of available raw materials for the present-day American chemical industry.

Searles Lake brine has long been known to carry small amounts of lithium in solution, but it was not until 1938 that a very limited recovery of a new crude lithium compound was commenced as an incidental coproduct of other operations. This lithium "concentrate," having a composition approximately represented by the formula Li_2NaPO_4, has found a ready market owing to its extremely high lithium content (19 to 21% Li_2O) compared with the best lithium ore concentrates available for further refining.

The brine entering the Trona plant contains approximately 2 tons of Li_2O per day equivalent to 10 tons of the compound Li_2NaPO_4. Not all of the material is available for recovery; considerable quantities are inevitably lost in the general plant operations and through occlusion as a trace impurity in the various plant productions. When wartime needs for lithium were found, however, to greatly exceed the domestic output capacity, an extensive research project was initiated to increase substantially the recovery of this material. As a result of this work, a new process was developed and tried out on a pilot-plant scale during 1943. This plant has quadrupled the original production and has a potential capacity considerably more than prewar world lithium requirements.

ABSTRACTS OF SEIZED ENEMY-OWNED U. S. PATENTS NOW AVAILABLE

The publication of two sets of Abstracts or short descriptions of 45,000 alien-owned U. S. patents seized by the Alien Property Custodian of the United States Government has been announced by J. E. Markham, Custodian.

Licenses to most of these patents are available to American citizens at a nominal fee of $15 per patent and are good for the life of the patent.

To help find items of particular interest, the Abstracts have been classified and indexed. The Mechanical and Electrical Abstracts (about 37,000 patents) consist of a short description and an illustrative drawing. The Chemical Abstracts (about 8000 patents) consist of a condensed description of the chemical principle involved.

The set of the Mechanical and Electrical Abstracts is bound in four volumes comprising approximately 4000 pages and includes a 48-page index. The set of Chemical Abstracts, in 33 sections, contains about 2000 pages and has a 400-page index.* Each set of abstracts sells for $25 and may be obtained from the Office of Alien Property Custodian, 311 Field Building, Chicago 3, Ill.

If the complete sets of Abstracts are not desired, portions of them (sections or classes dealing with any one subject) are obtainable at proportional cost. An index showing the section or class titles and prices may be obtained free of charge by writing to the Alien Property Custodian at the address given above.

* A number of patents from Section 11, Ceramic Materials and Silicates, have already appeared in *Ceramic Abstracts* (see the December, 1944, issue, pp. 266–67).

THE SOUTHERN RESEARCH INSTITUTE*

After four years of preliminary planning and promotion on the part of a group of Alabama businessmen, the Southern Research Institute is now a reality. More than $400,000 of the capital required for the institute has been raised by private subscription. This amount has been subscribed primarily in Alabama, where the movement to found the institute began. With the extension of the capital-raising campaign to other states, the supporters of the institute believe that perhaps $1,500,000 can be raised. Meanwhile, the amount now available has been regarded as sufficient for the commencement of actual work. A large brick dwelling on a two-acre site near downtown Birmingham has been purchased and is at present being fitted with modern laboratory and office equipment for a staff of twenty to twenty-five research workers. The newly appointed director, Wilbur Arthur Lazier, a well-known research chemist, is now in Birmingham and will assume his duties on October 1. Actual research work on the first of several industrial projects submitted to the institute by manufacturing companies of the South is scheduled to be under way by the end of 1944.

In its present beginning stage, the institute is a significant example of regional venturing in behalf of the technological advancement of Southern industry. If the institute develops as its founders confidently anticipate, an important contribution will have been made to the industrial research facilities of the region and to the development of high-value products manufactured from Southern materials.

In its method of operation, the Southern Research Institute is closely modeled upon the Mellon Institute of Industrial Research. An obvious distinction between the two is found in the sources of their capital funds. The Mellon Institute's source was a large private endowment; the Southern Research Institute is receiving such funds through private subscriptions that so far number more than 200 and range in amount from a maximum of $25,000 to a minimum of $25 a year.

The capital fund of the institute will not be used to pay the direct cost of research projects of any private enterprise, but to provide the laboratory equipment and other essential facilities of a modern research center. Most research projects and scientific investigations conducted in this center will be paid for by the business enterprises that suggest the projects and agree to sponsor them within the institute. The institute, from one aspect, may be termed a commercial laboratory and scientific investigative service organization, accepting private business companies as its paying clients. But it is a nonprofit corporation, and its charge for a given task of research will be the actual cost of that particular work plus a stipulated amount for overhead expenses. With a sufficient number of research investigations in progress, the institute accordingly may be expected to become self-supporting.

The first step in the working process is taken when a company or individual in the business field, to be generally in some branch of manufacturing or agriculture, comes to the institute with a technical problem, or an idea for a potential discovery, requiring chemical or other scientific research. As the second step, the institute makes a study of the proposal to determine to its own satisfaction that no previous patent covers the situation and that the project is worth while.

If the institute becomes satisfied upon these points and accepts the assignment, the third step is then taken. This step consists in the making of an agreement between the institute and the applicant business concern. The agreement ordinarily will cover a period of one year, but renewal may be permitted. Under the terms of the agreement, the institute takes full charge of the desired investigation and assumes responsibility for it. The institute agrees to create a research fellowship, devoted to the particular project, within its organization, and to find and employ a competent scientific specialist to undertake the given investigative task. The institute also agrees to direct and aid the research and to place its scientific resources at the specialist's disposal.

The business client, in turn, agrees to sponsor the particular fellowship that is established for the investigation that he has proposed. Sponsorship will include the payment to the institute of the actual costs of the work—primarily, the salary of the research fellow for the contract period—plus the contribution to overhead. Sponsorship will also include such cooperation as the business itself would ordinarily give a research worker of its own.

Thomas W. Martin

The relationship between the institute and the sponsor of a research project is entirely confidential. Without the consent of the sponsor, no publication of scientific findings may be made within a stipulated period. If a patentable new product or process results from a sponsored investigation, all ownership of patents and patent rights is to be vested in the sponsor.

Some investigations may, of course, require only short-time work. In such cases, the costs are estimated in advance and no special fellowship may be required. In addition, the institute itself will, as funds permit, originate and undertake certain investigations in its own behalf. These may include new or improved uses for Southern raw materials. In such cases, the institute itself would hold the patents and, upon proper occasion, lease them for purposes of production.

The plan thus outlined is in large part the one that the Mellon Institute has found to be the most workable in its thirty years' experience. Initially, the industrial fellowship system was conceived by Robert Kennedy Duncan, eminent scientist, in 1906 while he was in attendance at the Sixth International Congress of Applied Chemistry in Rome. Dr. Duncan in 1913 became the first director of

* Reprinted from the *Monthly Review* (Federal Reserve Bank of Atlanta), pp. 77–78, September, 1944.

the Mellon Institute and there put into practice the system that is now to be adapted to the industrial needs of the South.

Specific action leading to the establishment of the institute was first taken three years ago. For some time prior to that, the idea had been repeatedly urged upon businessmen by Dr. Stewart J. Lloyd of the School of Chemistry, University of Alabama. A few businessmen of Alabama had become convinced that the advancement of industry along lines of scientific exploration was not only a primary need of the South but was also the best means of furthering industrial expansion and improving the income of the region. Accordingly, the subject of scientific research was

Wilbur A. Lazier

again presented at the annual meeting of the Alabama State Chamber of Commerce in October, 1940, by Dr. George D. Palmer, Dean of Chemistry, University of Alabama. Dr. Palmer's report proved of so much interest that a committee was appointed, at the suggestion of Thomas W. Martin of Birmingham, to study the question.

Almost a year was spent by the committee, and its report was presented by Mr. Martin at the 1941 meeting of the State Chamber of Commerce, and adopted. The result was the decision to form the Alabama Research Institute, which was incorporated on October 11, 1941.

As the work of organization and fund-raising proceeded, the concept of the institute expanded to that of an all-Southern organization, capable of operating across state boundaries and aiding industry throughout the South and, in fact, throughout the nation. By amendment of the corporation's constitution and by-laws on June 15, 1944, the name Southern Research Institute was adopted. Business leaders of the Tennessee area gathered in Nashville on September 6 to consider the plans for the institute, and a similar meeting is scheduled for Atlanta, under the auspices of the industrial division of the Agricultural and Industrial Development Board of Georgia, on October 5.

The officers of the Southern Research Institute are at present those of the originally projected Alabama organization. They are chairman, Thomas W. Martin, president of the Alabama Power Company; vice-chairman, Wallace L. Caldwell, president of the Alabama Asphaltic Limestone Company, Birmingham; treasurer, Milton H. Fies, consulting engineer, Birmingham; secretary, John A. Maguire, Birmingham. The twenty-seven trustees include members of the original founding group and several from other Southeastern states.

Dr. Lazier, whose appointment as director of the institute was announced on August 27, 1944, was offered this post after a considerable inquiry in scientific circles had resulted in repeated recommendations of his scientific and personal qualifications. Dr. Lazier, at forty-four years of age, ranks as one of America's distinguished younger scientists in the field of chemistry. He graduated from the University of Illinois in 1922, took his doctorate in chemistry at the University of Wisconsin three years later, and since then has been occupied in research and development work at the Du Pont Experimental Station in Wilmington, Del. He is one of the nation's foremost authorities on problems of catalytic hydrogenation and played a leading part in the development of processes for producing intermediates used in the manufacture of nylon. For these and other scientific achievements, he was granted a Modern Pioneer Award of the National Association of Manufacturers in 1940. Since 1942 he has served as consultant to the National Defense Research Committee and has devoted much time to special chemical assignments for the armed services.

Implications for Southern industry in the establishment of the institute are of considerable long-range importance. By attracting research workers to the South, the institute is expected to ameliorate a condition of old standing, namely, a marked deficiency in the number of resident research workers, and to avoid the resulting effects upon the development of regional resources. According to the National Research Council, immediately prior to the war only 983 research workers resided in nine Southeastern states. Of this number, Alabama had 188, Arkansas 8, Florida 50, Georgia 71, Louisiana 356, Mississippi 53, North Carolina 49, South Carolina 95, and Tennessee 113. By comparison, New York alone had 9514 research workers and New Jersey 6057. Ohio, Pennsylvania, and Illinois had approximately 4700 each, and Connecticut, ranking eleventh in the number of such workers, had 965, or almost as many as the nine Southeastern states combined.

The number of patents granted in a recent ten-year period by the United States Patent Office shows a general correlation with the number of research workers, by states. Thus New York in the years 1934–1943, inclusive, received 79,072 patents; Illinois, 41,853; Pennsylvania and New Jersey, about 30,000 each; and Connecticut, 12,069. In contrast, the nine Southeastern states in the same period received 10,825 patents, distributed as follows: Alabama 1013, Arkansas 469, Florida 2185, Georgia 1465, Louisiana 1288, Mississippi 383, North Carolina 1458, South Carolina 560, and Tennessee 2004. This total of 10,825 patents was only 2.9 per cent of the national total of patents issued during the decade 1934–1943, and the proportion of the nation's research workers living in the South was but 2.2 per cent.

Partly accounting for the relative lack of discoveries leading to patents owned by Southern enterprises is the familiar fact that the Southern area, in general, has an unusually high percentage of manufacturing plants that are affiliates or branches of national concerns. These plants utilize the patents of their parent companies. But there are also many independent manufacturing enterprises, generally small or medium in size, and it is in connection with such enterprises that the work of the institute may have an especial significance. An important differential between the smaller and the larger enterprises lies

in their access to scientific work and the findings of technical research. Leaders of the institute believe the new facilities will tend to equalize this differential for the South. "One of the advantages of associative research," states a pamphlet of the new institute, "is that it enables a small manufacturer, who cannot afford to have a laboratory of his own, to profit from scientific research in the same manner as a larger manufacturer." Since the cost for most projects of practical importance is not prohibitive, it is believed that many of the institute's clients will be the smaller and unaffiliated concerns.

The productive economy of the Southeast has, up to the present war at least, suffered from a neglect, in the section, of the higher and more elaborate types of processing, and the abundant raw materials of the region, whether mineral or agricultural, have not been fully utilized in the scientific sense. That much of the region's manufacturing output was more or less rudimentary in type was reflected in the Census of Manufactures for 1939, which showed that the nine Southeastern states previously mentioned, though having 14.1 per cent of the nation's workers in manufacturing, produced but 8.7 per cent of the total value of manufactured products. The average manufacturing worker of the nation added $3130 to the value of the raw materials processed in 1939, but the average worker of the nine Southern states added only $1825 in product value.

Apparently, Chairman Martin had these facts in mind when he said, in a recent public address: "We, in the Southern region, must recognize that in research in the natural sciences we have in the past been highly deficient; that it is technological research, generally absent in the South, that creates new finished goods industries; and that the increase of technological research is perhaps the most important long-range project in the South. . . . It is a happy omen that the South is awakening to its opportunity."

BORAX
and
BORIC ACID
99½-100% PURE
NITRATE OF POTASH
CAUSTIC SODA
SULPHUR
Stauffer CHEMICALS SINCE 1885
STAUFFER CHEMICAL CO.
420 Lexington Avenue, New York, N. Y. 624 California Street, San Francisco, Cal.
444 Lake Shore Drive, Chicago, Illinois 350 South Flower Street, Los Angeles, Cal.

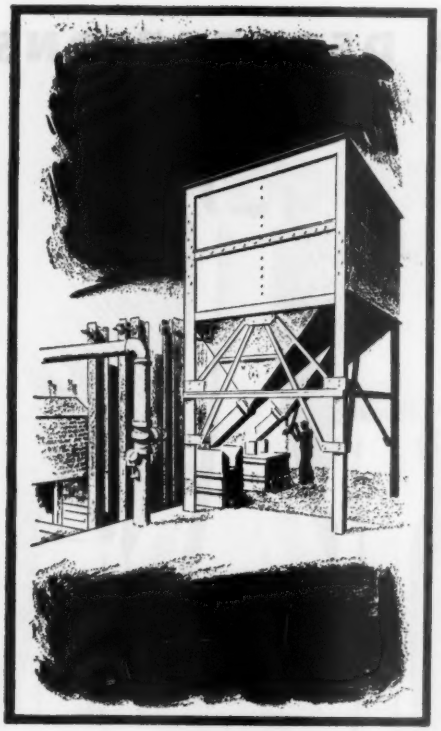
LOCAL SECTIONS

The Local Sections of The American Ceramic Society are assuming a new importance since the announcement of the postponement of the Annual Meeting. Local Section meetings including attendance from the commuting area are approved in the O.D.T. ruling which discouraged national meetings. This makes it possible for our Society to continue much of its important work.

Already four Local Sections have scheduled meetings at which papers will be read: Chicago, Saturday, April 7; Upstate New York at Buffalo, Monday, April 16; Pittsburgh, Friday, May 11; and Baltimore-Washington at Baltimore, Saturday, June 2.

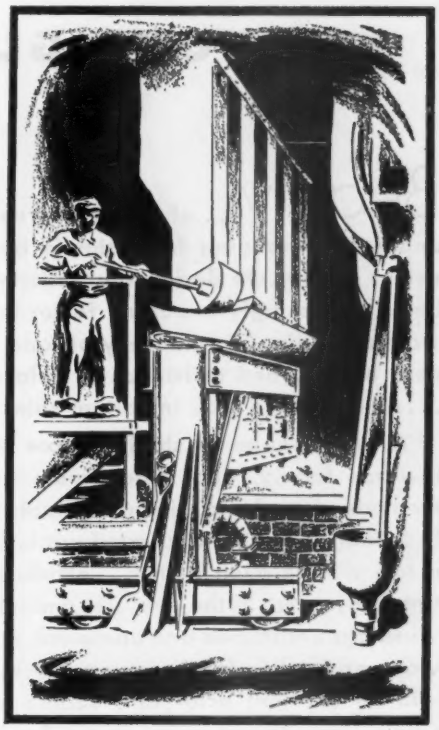
You can help. If you have a paper ready, see the chairman of your Local Section. He may need you on the next program.

In the meantime, send your paper to The Society offices at once so that it can be scheduled for publication.



DO NOT CHARGE THIS WAY

BUT



CHARGE THIS WAY FOR QUALITY GLASS

If you want to make better glass with lower operating costs, use the SIMPLEX Blanket Method of Feeding the Raw Materials to your Tank Furnace, as shown above.

A SIMPLEX Representative can help you in this connection.

FRAZIER-SIMPLEX, INC.

ENGINEERS

436 EAST BEAU STREET • WASHINGTON, PENNA., U.S.A.

DISTINCTION AND DURABILITY

IN YOUR GLASSWARE DECORATIONS

Beauty... of warm rich color—in applications ranging from simple bands or stripes to intricate design and lettering, will be an increasingly important factor in glassware marketing. Permanency of tone, sharpness of line, and resistance to defacements ... all will have their important sales value.

A wider range of shades, more stability towards fading, and faster, more accurate methods of applying will be available as aids in turning out better decorated work. Du Pont colors will be even better ... alkali-resistant tints that speak to the eye, yet endure many washings undimmed and unmarred. For table ware and other food-serving pieces, there will be Du Pont acid- and sulfide-resistant colors—safe to use inside or out, hot or cold, as foods will not affect them. A new Squeegee Oil from Du Pont will be important in screen color work for multi-color design or legend decoration.

And new information too! Demonstration and testing in your own plant by our technical staff will provide recommendations for materials and processes that you *know* will work. To learn of what Du Pont has to offer in glass and ceramic colors, write E. I. Du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington 98, Delaware.

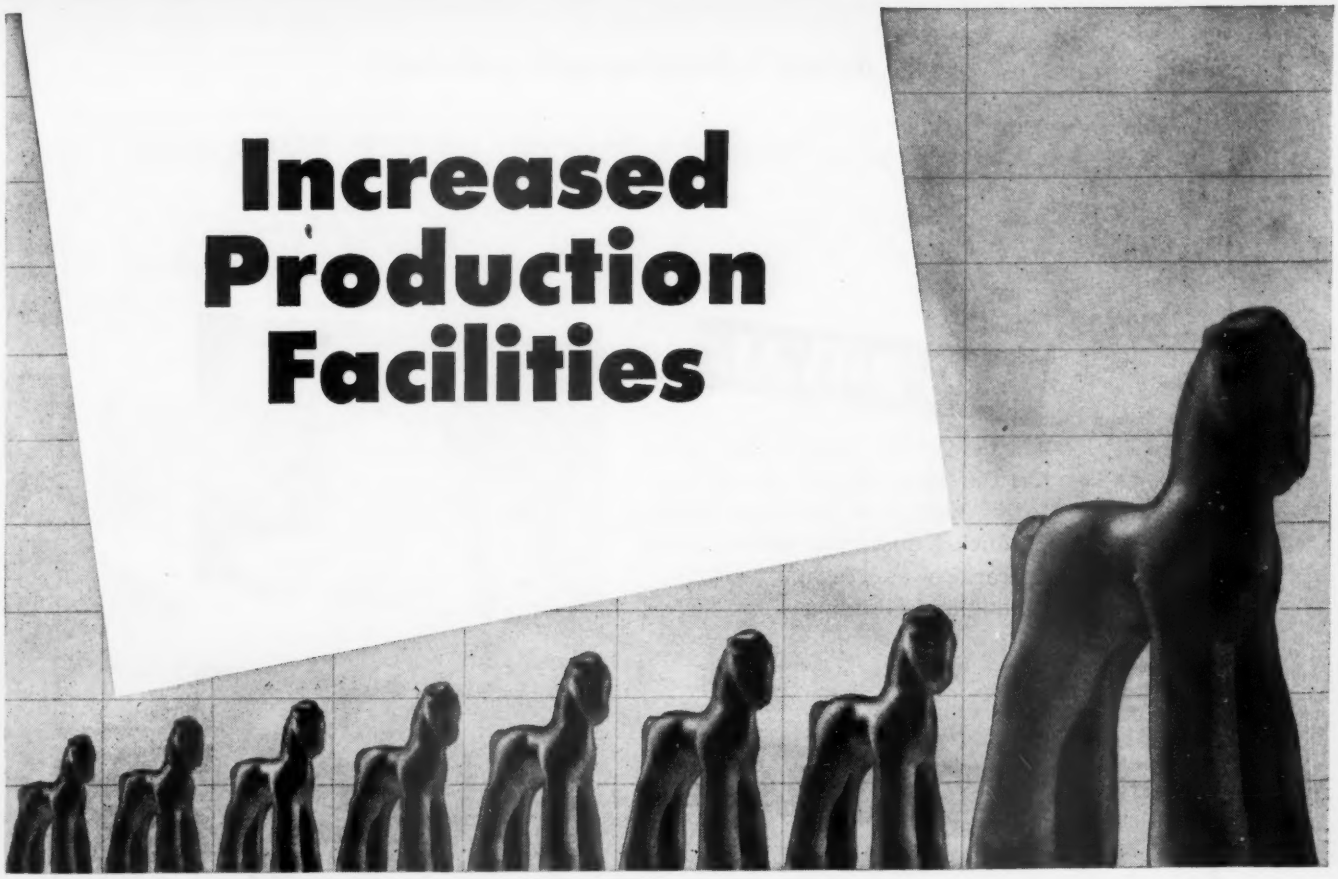
DU PONT

COLORS and DECORATIONS for CERAMICS and GLASS

DUPONT

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

Increased Production Facilities



"NEPHSY"

1937 **1945**

. . . PROMPT DELIVERIES of Lakefield NEPHELINE SYENITE Now Assured

You will have several additional advantages in buying Lakefield NEPHELINE SYENITE this year.

We are doubling production. New grinding and processing equipment at the mill, another steam shovel, barge, enlarged trackage and dock facilities—will further speed deliveries.

You will find that the iron oxide content—always very low—has been still further reduced by our changeover to the flotation method of iron mineral removal. This water classification process also removes dust, which might otherwise be encountered in unloading and handling.

Remember with Lakefield NEPHELINE SYENITE you get dependable uniformity, easier melting glass and enamel batches, and in whiteware lower firing temperatures and longer firing ranges.

West Coast Representative: Elwyn L. Maxson, Los Angeles
Mailing address: 1526 Canada Blvd., Glendale 8, California

Great Lakes
FOUNDRY SAND COMPANY — DETROIT
CERAMIC DIVISION

HIGH ALUMINA CONTENT • IDEAL FLUXING PROPERTIES

Lakefield NEPHELINE SYENITE

APPROVAL

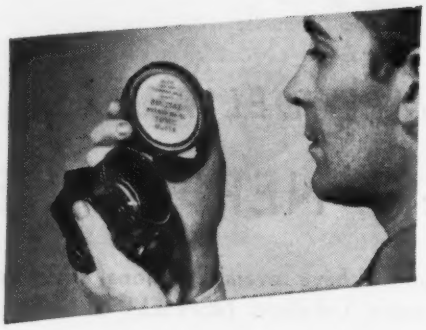
The new Willson No. 45 Respirator has Bureau of Mines approvals for toxic dusts and pneumoconiosis-producing dusts and mists in such operations as crushing, grinding, milling and abrading.

FACE FIT

Flexible rubber facepiece with adjustable spring gives comfortable but snug fit. Elastic headband maintains dust-tight seal.

UTILITY

Filters easily replaced in screw-type assembly. Replacement filters low in cost. Foolproof assembly assures proper operation after replacement.



Get in touch with your Willson Safety Service Distributor for full information on new No. 45 Respirator. Or, write to Dept. AC-3.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON

PRODUCTS INCORPORATED

READING, PA., U.S.A. *Established 1870*

McDANEL REFRACTORY PORCELAIN COMPANY

Manufacturers of

PYROMETER TUBES AND INSULATORS
COMBUSTION TUBES AND BOATS
GAS ANALYSIS TUBES

LABORATORY GRINDING JARS
PORCELAIN MILL LININGS
PORCELAIN GRINDING BALLS

BEAVER FALLS PENNSYLVANIA

THREE ELEPHANT

REG. U.S. PAT. OFF. REG. U.S. PAT. OFF.

AND BORIC ACID

GUARANTEED OVER 99.5% PURE

AMERICAN POTASH & CHEMICAL CORPORATION

122 E. 42nd Street, New York

INDUSTRIAL CERAMIC PRODUCTS, Inc.

MANUFACTURERS

PINS CONE PLAQUES STILTS

COLUMBUS 8, OHIO

WANTED

Two ceramic graduates for industrial fellowship research work at the New York State College of Ceramics, Alfred, N. Y. Address, M. E. Holmes, New York State College of Ceramics, Alfred, N. Y.

WANTED
CERAMIC ENGINEER

For abrasive bonding work.
Permanent position in Southern California.
Submit age, experience and educational qualifications.
Include personal photo if available.

Address: Dozier Graham Eastman
Room 906 Bendix Bldg., Los Angeles 15, Calif.

CLAYS

English China and Ball

— —

TALCS

for

HEATING ELEMENTS
CERAMIC BODIES
SAGGER USES

— —

Ceramic Specialties Include

Whiting : Paris White : Magnesite
Cornwall Stone : Barium Carbonate
Zinc Oxide : Enameling Clays : Etc.

HAMMILL & GILLESPIE, INC.

Importers since 1848

225 Broadway New York

Industrial Technical CEMENTS by SAUEREISEN

In considering any material that enters deeply into the worth of your product, perhaps the first thing to think of is the record, the integrity, the good name of the man who stands back of the material.

Which?

SAUEREISEN No. 1, for many years called INSALUTE, the strongest adhesive known to industry.
Trial Gallon, $3.80—5 gal. pails $17.60

SAUEREISEN No. 30, enormous use in assembling small units; works fast, very convenient. Trial Gallon, $2.50
—Ton lots 13¢ per pound

SAUEREISEN No. 32, Very similar to No. 30, but slower set, giving time for related operations. Used on millions of spark plugs.
Trial Gallon, $3.00

SAUEREISEN No. DW-30, similar to No. 30. Used on Westinghouse Electric Roasters.
Trial Gallon, $2.50

SAUEREISEN No. 78, Hardens into porcelain, completely insulates electricity but transmits heat.
Trial Gallon, $5.50—Used on the best Electrical Resistors

SAUEREISEN No. 31, famous the country over for acid-proofing tanks, vats, digesters, stacks, etc.
Trial Gallon $2.50—Ton lots 7¢ per pound.

No mere claim could possibly convey a true understanding of the lofty attainments that surround the Sauereisen Cements Company. Perhaps the true index to this lies in the fact that PRACTICALLY EVERY GREAT NAME IN AMERICAN INDUSTRY is a consistent user of Sauereisen Materials.

In this lies your sufficient assurance, more convincing than any guarantee, that whatever you select from the Sauereisen Line—if correctly selected for the intended purpose—will stand up faithfully in service.

"There is a Sauereisen Cement for Every Industrial Purpose." We list a few. If you are sure of your need, order a gallon for practical test purposes. If you are not sure, give us complete information as to your requirements, and we will recommend.

Over 2,000,000 pounds sold by Mail yearly. Why wait for a salesman—Order by mail.

sauer eisen
SINCE 1899

SAUEREISEN CEMENTS COMPANY
Sharpsburg Station PITTSBURGH 15, PA.

An Enameling Improvement ready *now!*

THE Titanium Alloy Manufacturing Company announces a new titanium alloy enameling steel which offers improved quality and reduced cost to the manufacturers of vitreous enameled products.

This new steel has exceptional ductility, being in this respect at least equal to the best deep drawing steels previously known. It also has superior resistance to sagging at enameling temperatures.

Tests conducted in many different laboratories have indicated that the use of titanium alloy enameling steel virtually eliminates primary boiling because of the fact that the carbon in the steel has been stabilized by the titanium. This indicates that ground coat can be eliminated, assuring greater uniformity of finished product and reducing rejects and re-operations very substantially. It permits furthermore the application of lighter coats of enamel with the consequent reduction in cost and improvement in appearance and wearing qualities of many enameled articles.

There are many additional features of interest to both steel producers and manufacturers of enameled products.

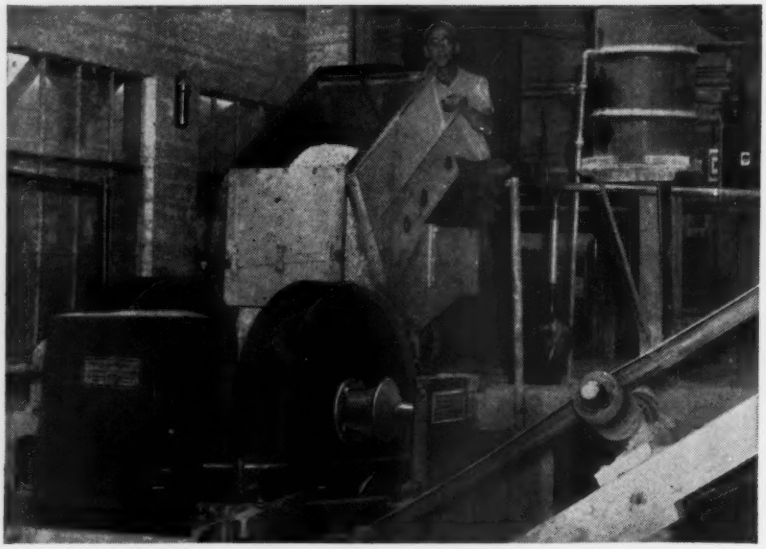
A member of our Technical Staff will be glad to go over details with you at your convenience. Send us a card for prompt action.

★ ★ ★

Pending patent applications on the new enameling process and product made thereby are owned by Inland Steel Company and The Titanium Alloy Manufacturing Company under Trust Agreement.

THE TITANIUM ALLOY MANUFACTURING COMPANY

Executive Offices: 111 BROADWAY, NEW YORK *General Offices and Works:* NIAGARA FALLS, N. Y.



Clearfield No. 610 Mixer in Fire Brick Plant

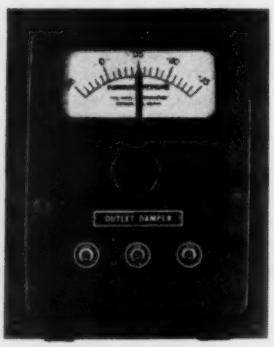
CLEARFIELD MACHINE COMPANY
Clearfield, Penna.

CLEARFIELD MIXER users include

Armstrong Cork Co.
Basic Refractories Co.
Big Savage Refractories Co.
Botfield Refractories Co.
Canadian Refractories Co.
Electro Metallurgical Co.
Gladding, McBean and Co.
General Refractories Co.
Harbison-Walker Refractories Co.
Ironton Fire Brick Co.
Koppers Co.
Liquid Carbonic Co.
North American Refractories Co.
Oak Hill Fire Brick Co.
Pittsburgh Plate Glass Co.
Reichard-Coulston Co.
Hiram Swank's Sons
Wellsville Fire Brick Co.
Western Refractories Co.

CONTROL FOR CERAMIC INDUSTRY

Below is pictured the Hays Automatic Tank Pressure Controller Type CDE-X which is typical of Hays Controllers. It is provided with a manual adjusting knob accessible from front of case for setting the Controller for the differential pressure to be maintained. Indicator and scales indicate differential or furnace pressure for which the Controller is set.



Hays Instruments for the Ceramic Field include air and gas measuring, indicating and recording Gauges, draft and pressure Indicators and Recorders, Gas-Air Ratio Meters, Oil-Air Proportioning Meters, Combustion Meters, CO_2 Recorders and complete Systems of Automatic Combustion Control.

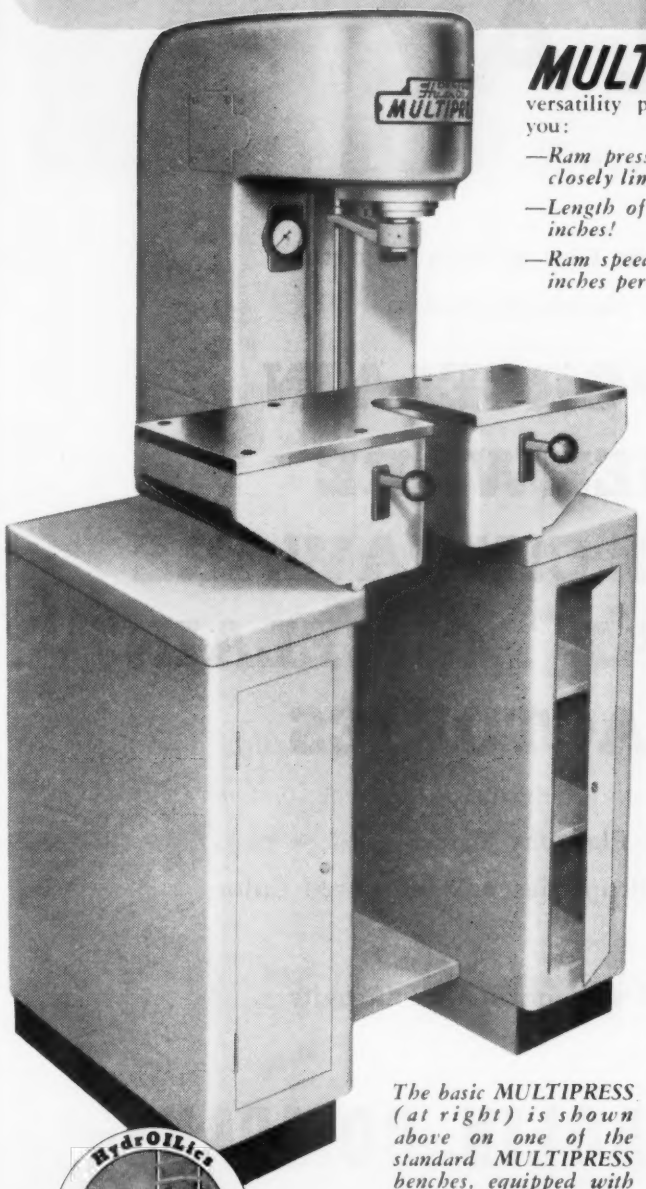
Bulletin 42-552 explains the application of Instruments and Controllers to Ceramic furnaces, Glass tanks, Pottery kilns and Enameling furnaces with schematic drawing of a complete system of Automatic Control of Combustion and Pressures—sent free upon request.

Save in time, materials, fuel, man-power; minimize spoilage and guarantee a better, more uniform product through the use of Hays instruments and control.

SPECIAL NOTE! Be sure to send for your Free Copy of Bulletin 43-552 "Instrumentation and Control of Ceramic Furnaces, Pottery Kilns, Glass Tanks and Enameling Furnaces."

The HAYS CORPORATION
SINCE 1901 COMBUSTION INSTRUMENTS AND CONTROL
MICHIGAN CITY, INDIANA, U.S.A.

MULTIPRESS the NEW Industrial Tool with Features the Ceramic Industry Wants!



MULTIPRESS A powerhouse of production versatility packed into a space-saving, bench-size unit—offers you:

—Ram pressures from 300 to 8,000 pounds . . . and you can closely limit them anywhere in that range!

—Length of ram stroke easily adjustable from 1/16-inch to six inches!

—Ram speeds up to 200 inches per minute downward, and 300 inches per minute upward.

—Full "feather-touch" control of ram travel and pressure at all times—plus many other controls.

—A completely self-contained, motor-driven, oil-hydraulic machine tool! Easily portable. Delivered ready to connect and operate, after installation of a motor-starter.

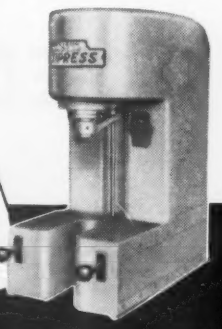
—Built for a wide range of standard accessories that further broaden the applications of the basic Multipress.

MULTIPRESS is 16 inches wide, 26 inches deep, and 34 inches high, weighs only 725 pounds, and has a table area of 10½x16 inches, which can be increased to 10½x32 inches with table extensions.

The ram responds instantly to the slightest movement of the control levers—may be lowered rapidly or slowly, or stopped anywhere in its downward travel while the work is positioned beneath it. Pressures can be increased gradually or applied in full at once. The gauge shows pressures exerted on the ram in both tons and pounds per square inch.

A MULTIPRESS accessory control of special interest to the Ceramic field is Automatic Multi-speed Vibra-pres. It provides a wide range of pressing speeds, and almost any number of short, repeated, and exact pressure strokes upon the work, at each full downstroke of the ram. Thus the operator can regulate Multipress to suit the characteristics of the ware being pressed. Matching benches, table extensions, side shelves, a variety of bolster plates, and other special ram action controls are also among the standard Multipress Accessories. The Denison Engineering Co., 1161 Dublin Road, Columbus 16, Ohio.

The basic MULTIPRESS (at right) is shown above on one of the standard MULTIPRESS benches, equipped with standard extension tables.



HydrOILics INDUSTRY'S RIGHT HAND

DENISON EQUIPMENT in APPLIED HydrOILics

Basic Unit $575.00 Patents Applied For

PIONEER CLAY

Used by the trade since 1901

American China Clay of high strength
and low shrinkage used in

SEMI-PORCELAIN
DINNERWARE
VITRIFIED CHINAWARE
ELECTRICAL PORCELAIN
REFRACTORIES

High Plasticity Value
Excellent Working Properties • White Fired Color

Water Washed • Controlled Uniformity

GEORGIA KAOLIN COMPANY

EST. 1901

Mines and plants, Dry Branch, Ga.

MAIN OFFICE

433 No. Broad St., Elizabeth, N. J.

Insure Kiln Firing

with ORTON

Standard Pyrometric Cones

The production of uniform A-1 quality ware, with negligible kiln losses and at low cost will be insured when

- ∧ **the rate of heating throughout the setting is controlled**
- ∧ ∧ **the end point of firing is always the same**
- ∧ ∧ ∧ **the heat is uniformly distributed throughout the kiln chamber**

Orton Standard Pyrometric Cones provide a simple, low cost method for determining the above conditions in the kiln and serve to warn the operator as to when kiln control adjustments should be made.

ORTON STANDARD PYROMETRIC CONES
"The accepted standard for nearly a half century"

The Edward Orton, Jr., Ceramic Foundation

1445 SUMMIT STREET COLUMBUS 1, OHIO

California Representative:
E. L. Maxson, 1526 Canada Blvd., Glendale, Calif.

South American Representative:
Allied Argentina S. A., de Ingenieria Ceramica, Corrientes 378, Buenos Aires, Argentina

VITRO

TRADE MARK

A SYMBOL OF PROGRESS IN THE DEVELOPMENT OF CERAMIC COLORS

THE VITRO MANUFACTURING CO.

CORLISS STATION **PITTSBURGH, PA.**

16 California St., SAN FRANCISCO, CAL.

BORAX *Guaranteed 99½%–100% Pure* BORIC ACID

Select the Brand which has back of it years of *successful use* by experienced Ceramists

Pacific Coast Borax Co., New York

Chicago **Los Angeles**

Finely Prepared Feldspar

CLINCHFIELD SAND & FELDSPAR CORP.

618 Mercantile Trust Building

Baltimore 2, Maryland

MILL—BEDFORD, VIRGINIA

WANTED TO BUY

March 1944 Bulletin

The American Ceramic Society, Inc.

2525 N. High St.,

Columbus 2, Ohio

PHOTOVOLT
Photoelectric REFLECTION METER
for measuring **Whiteness**
Gloss
Color
of ceramic surfaces

- Portable, rugged, simple in operation.
- With interchangeable search units for diffuse and specular reflection.
- Applicable to surfaces of any size including inside surfaces of enamel utensils.

Write for literature.

PHOTOVOLT CORP.
95 Madison Ave. New York 16, N. Y.

B A G S
BAGGING
BURLAP

New and Second-Hand

The foundation of business is confidence, which springs from integrity, fair dealing, efficient service and mutual benefit.

MANUFACTURERS—DEALERS—
IMPORTERS—EXPORTERS

Write—Wire—Phone

BURROS
BAG COMPANY, INC.
PLYMOUTH and ADAMS STS.,
BROOKLYN 1, NEW YORK

Specify **SOLVAY**
TRADE MARK REG. U. S. PAT. OFF.
Quality RAW MATERIALS
FOR THE CERAMIC INDUSTRY

SOLVAY
DENSE SODA ASH

58% Dustless

The purity of Solvay Soda Ash is carefully controlled to meet the exacting requirements of the ceramic industry. The product is obtainable in several granulations to meet specific needs. Each granulation is uniform in quality and free from dust, gives a homogeneous mix, is free flowing and insures rapid melting.

SOLVAY
POTASSIUM CARBONATE

90-100% Dustless Calcined
83-85% Granular Hydrated

The Calcined grade—produced by an exclusive Solvay process—is in the form of small chalk-white round granules. Its dustless properties and granulation assure the glassmaker of a product which will readily combine with other ingredients in producing a homogeneous melt. The Granular Hydrated grade, in transparent white uniform crystals, is the older form of Potassium Carbonate, which Solvay produces by the most modern methods, ensuring a uniform, highly pure product.

SOLVAY SALES CORPORATION
Alkalies and Chemical Products Manufactured by The Solvay Process Company
40 Rector Street New York 6, N. Y.

BRANCH SALES OFFICES:

Boston	Cincinnati	New Orleans	Pittsburgh
Charlotte	Cleveland	New York	St. Louis
Chicago	Detroit	Philadelphia	Syracuse

Abrasives
Bausch & Lomb Optical Co.
Carborundum Co. (*Carborundum and Alozite*)
Electro Refractories & Alloys Corp.
Hommel, O., Co., Inc.
Norton Co. (*Alundum-Crystolon*)

Acid-proof Mortars
Corhart Refractories Co.

Air Conditioning Systems
Frazier-Simplex, Inc.

Aloxite (Refractory Products)
Carborundum Co.

Alumina (Hydrate and Calcined)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Vitro Mfg. Co.

Alumina (Fused) Brick and Tile
Electro Refractories & Alloys Corp.
Remmey, Richard C., Son Co.
Vitro Mfg. Co.

Aluminum Oxide (Calcine)
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Aluminum Oxide (Fused)
Carborundum Co.
Electro Refractories & Alloys Corp.
Foote Mineral Co.
Norton Co.
Vitro Mfg. Co.

Alundum (Refractory Products)
Norton Co.

Ammonium Bicarbonate
Du Pont de Nemours, E. I., & Co., Inc.
Hommel, O., Co., Inc.
Solvay Sales Corp.

Ammonium Bifluoride
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Innis, Speiden & Co.
Vitro Mfg. Co.

Ammonium Carbonate
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Antimony Oxide
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Vitro Mfg. Co.

Antimony Sulphide
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Arches (Interlocking, Suspended, and Circular)
Frazier-Simplex, Inc.

Arsenic
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Automatic Brick Car Loaders
Lancaster Iron Works, Inc.

Ball Mills
Drakenfeld, B. F., & Co., Inc.
Hommel, O., Co., Inc.
McDanel Refractory Porcelain Co.
Vitro Mfg. Co.

Ball Mills (Laboratory Type)
Drakenfeld, B. F., & Co., Inc.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Barium Carbonate
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Barytes
Clinchfield Sand & Feldspar Corp.
Harshaw Chemical Co.

Basic Oxides
Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.

Batch Systems & Chargers
Frazier-Simplex, Inc.

Batts
Carborundum Co. (*"Carbofrax Alozite"*)
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)
Remmey, Richard C., Son Co.

Bentonite
Great Lakes Foundry Sand Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Beryl
Foote Mineral Co.

Bichromate of Soda
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Bitstone
Potters Supply Co.

Blocks (Refractory)
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.
Vitro Mfg. Co.

Blowers
Robinson Ventilating Co.

Body Stains
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.

Bone Ash
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Borax
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Innis, Speiden & Co.
Pacific Coast Borax Co.
Pemco Corp.
Stauffer Chemical Co.
Vitro Mfg. Co.

Borax Glass
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
Vitro Mfg. Co.

Boric Acid (Anhydrous)
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
Vitro Mfg. Co.

Boric Acid (Crystal, Granular, or Powder)
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Innis, Speiden & Co.
Pacific Coast Borax Co.
Stauffer Chemical Co.
Vitro Mfg. Co.

Boron Carbide
Norton Co.

Brick Machines (also Barrows, Molds)
Lancaster Iron Works, Inc.

Brick (Refractory)
Carborundum Co. (*"Carbofrax Alozite"*)
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.
Vitro Mfg. Co.

Cadmium Oxide
Drakenfeld, B. F., & Co., Inc.

Cadmium Sulphide
Drakenfeld, B. F., & Co., Inc.
Du Pont, de Nemours and Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Carbofrax (Refractory Products)
Carborundum Co.

Carbonates (Barium, Lead)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Castings
Lancaster Iron Works, Inc.

Caustic Potash
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Solvay Sales Corp.

Caustic Soda
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
Stauffer Chemical Co.
Vitro Mfg. Co.

Cements
Bausch & Lomb Optical Co.
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Pennsylvania Salt Mfg. Co.
Remmey, Richard C., Son Co.
Sauereisen Cements Co.
Taylor, Charles, Sons Co.

Ceramic Chemicals
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Prod.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Metal & Thermit Corp.
Pemco Corp.
Pennsylvania Salt Mfg. Co.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Cerium Oxide
Drakenfeld, B. F., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Chromite (Natural Chromate of Iron)
Foote Mineral Co.
Hommel, O., Co., Inc.

Chromium Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Pemco Corp.
Vitro Mfg. Co.

Clay (Ball)
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Potters Supply Co.
Spinks, H. C., Clay Co.
Vitro Mfg. Co.

Clay (China)
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Vitro Mfg. Co.

Clay—Cleaners, Feeders
Lancaster Iron Works, Inc.

Clay (Electrical Porcelain)
Hammill & Gillespie, Inc.
Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Enamel)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Prod.
Ferro Enamel Corp.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Kentucky Clay Mining Corp.
Maxson, Elwyn L.
Metal & Thermit Corp.
Pemco Corp.
Spinks, H. C., Clay Co.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Clay (Fire)
Great Lakes Foundry Sand Co.
Maxson, Elwyn L.
Potters Supply Co.
Taylor, Charles, Sons Co.

Clay (Micronized)
Pemco Corp.

Clay Miners
Great Lakes Foundry Sand Co.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Modeling)
Potters Supply Co.

Clay (Potters)
Hammill & Gillespie, Inc.
Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Process Equipment)
Lancaster Iron Works, Inc.

Clay (Sagger)
Georgia Kaolin Co.
Great Lakes Foundry Sand Co.
Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay-Slip (Albany)
Hammill & Gillespie, Inc.

EMERSON P. POSTE

CONSULTING CHEMICAL ENGINEER

ANALYSES: CERAMIC RAW MATERIALS AND PRODUCTS, FUELS, IRON AND STEEL, ETC.

SPECIAL INVESTIGATIONS: PHYSICAL AND CHEMICAL TESTS ON ENAMEL, ETC.

309 McCALLIE AVE.,
CHATTANOOGA, TENN

THE SHARP-SCHURTZ COMPANY

CHEMISTS FOR THE CERAMIC INDUSTRY

WE HAVE FULLY EQUIPPED LABORATORIES AT

LANCASTER, OHIO U. S. A.

BACK NUMBERS
OF
THE JOURNAL—CERAMIC ABSTRACTS AND THE BULLETIN OF AMERICAN CERAMIC SOCIETY
AND ALL IMPORTANT MAGAZINES FROM THE WORLD OVER
We furnish single copies, volumes, or sets reasonably and promptly
WRITE, PHONE OR WIRE PERIODICALS DEPARTMENT
THE H. W. WILSON COMPANY 950 University Avenue, New York

The Best West of the Rockies

- **POTTERY CLAYS**
  English and American
- **CERAMIC COLORS**
  Blythe Colour Works, Ltd.
- **SLABS...SETTERS...SAGGERS**
  New Castle Refractories Co.
- **STANDARD PYROMETRIC CONES**
  Edward Orton, Jr., Ceramic Foundation
- **FRANTZ FERROFILTERS**
- **LAKEFIELD NEPHELINE SYENITE**
  Great Lakes Foundry Sand Co.

ELWYN L. MAXSON

Offices & Storeroom 1526 Canada Blvd., Glendale, Calif.

Hommel O., Co., Inc.
Maxson, Elwyn L.

Clay (Wad)
Kentucky Clay Mining Co.
Spinks, H. C., Clay Co.

Clay (Wall Tile)
Hammill & Gillespie, Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Cleaners
Harshaw Chemical Co.
Pemco Corp.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.

Clocks (Gauge Board)
Hommel, O., Co., Inc.

CO_2 Recorders
Hays Corp.
Leeds & Northrup Co.

Cobalt, Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Vitro Mfg. Co.

Cobalt Sulphate
Drakenfeld, B. F., & Co., Inc.
Du Pont, de Nemours, E. I., & Co., Inc. Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Colors
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Prod.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Maxson, Elwyn L.
Pemco Corp.
Vitro Mfg. Co.

Combustion Control
Hays Corp.
Leeds & Northrup Co.

Combustion Meters (CO_2 Recorders)
Hays Corp.
Leeds & Northrup Co.

Cone Plaques
Industrial Ceramic Products, Inc.

Cones
Edward Orton, Jr., Ceramic Foundation
Maxson, Elwyn L.

Controllers—Automatic Tank Pressure
Hays Corp.
Leeds & Northrup Co.

Conveying Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

Copper Oxide
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Cornwall Stone (Imported)
Drakenfeld, B. F., & Co., Inc.
Hammill & Gillespie, Inc.
Hommel, O., Co., Inc.
Maxson, Elwyn L.

Corundum Refractories
Corhart Refractories Co.

Crucibles (Filter, Melting, Ignition)
Norton Co.
Taylor, Charles, Sons Co.

Crushers (Clay)
Lancaster Iron Works, Inc.

Cryolite (see Kryolith)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.
Vitro Mfg. Co.

Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
Frazier-Simplex, Inc.

Cutters (Bar)
Industrial Ceramic Products, Inc.

Decalcomania
Commercial Decal, Inc.

Decorating Supplies
Ceramic Color & Chemical Mfg. Co.
Commercial Decal, Inc.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electro chemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Disintegrators
Lancaster Iron Works, Inc.

Dryer (Pipe Rack)
Lancaster Iron Works, Inc.

Dryers (Waste Heat, Continuous and Batch Type)
Harrop Ceramic Service Co.

Drying Machinery
Frazier-Simplex, Inc.
Lancaster Works, Inc.

Electrocast Refractories
Corhart Refractories Co.

Enameling Equipment (Complete)
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Enameling Furnaces
Carborundum Co.
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Norton Co.

Enameling Iron (Sheet)
American Rolling Mill Co.

Enameling Muffles
Carborundum Co. (*Carbofrax*)
Maxson, Elwyn L.
Norton Co. (*Alundum*)

Enameling (Practical Service)
Chicago Vitreous Enamel Prod.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Metal & Thermit Corp.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Enamels
Chicago Vitreous Enamel Prod.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Maxson, Elwyn L.
Pemco Corp.
Vitro Mfg. Co.

Enamel Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Enamels (Porcelain)
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Engineering Service
Ferro Enamel Corp.
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.

Epsom Salts
Innis, Speiden & Co.

Equipment (Porcelain Enameling)
Ferro Enamel Corp.
Hommel, O., Co., Inc.

Fans
Robinson Ventilating Co.

Feldspar
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Solvay Sales Corp.
Vitro Mfg. Co.

Filter Fabrics
Metakloth Company

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Great Lakes Foundry Sand Co.
Spinks, H. C., Clay Co.
Taylor, Charles, Sons Co.

Flint
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc.
Great Lakes Foundry Sand Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.

Flint Pebbles
Clinchfield Sand & Feldspar Corp.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Vitro Mfg. Co.

Flint (Soft decomposed Cararra)
Innis, Speiden & Co.

Floating Construction for Tunnel Kiln Cars
Electro Refractories and Alloys Corp.

Floors (Non-Slip)
Norton Co.

Fluorspar
Harshaw Chemical Co.
Hommel, O., Co., Inc.

French Flint
Maxson, Elwyn L.

Frit
Chicago Vitreous Enamel Prod.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Maxson, Elwyn L.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Frosting Mixtures
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Fuel Oil Systems and Control Stokers
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.

Furnaces
Carborundum Co. (*Carboradiant*)
Ferro Enamel Corp.
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.
Hommel, O., Co., Inc.
Swindell-Dressler Corp.

Furnaces (Laboratory)
Remmey, Richard C., Son Co.

Furnaces, Enameling
Ferro Enamel Corp.
Swindell-Dressler Corp.

Gauges, Draft (Recording, Indicating)
Hays Corp.
Leeds & Northrup Co.

Gauges, Flow (Air and Gas)
Hays Corp.

Gauges, Pressure
Hays Corp.
Leeds & Northrup Co.

Glass Bending Ovens, Glass Decorating Machines
Frazier-Simplex, Inc.

Glass Equipment (Batch Mixer)
Lancaster Iron Works, Inc.

Glass Furnace Refractories
Corhart Refractories Co.

Glass Melting Tanks and Furnaces
Frazier-Simplex, Inc.

Glass Sand
Great Lakes Foundry Sand Co.

Glass Thickness Gauge
Bausch & Lomb Optical Co.

Glaze and Body Spar
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Vitro Mfg. Co.

Glazes and Enamels
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Glaze Spar
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.

Goggles
Bausch & Lomb Optical Co.
Hommel, O., Co., Inc.
Willson Products, Inc.

Gold
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Gold Decorations
Du Pont de Nemours, E. I., & Co., Inc Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Ceramic Service? We Give It

We Manufacture–

Pins—all shapes and lengths
Stilts
Thimbles
Spurs
Saggers—Bisque ovals only
Crucibles
Modeling Clay

We Sell–

Ball Clays—Kentucky
Sagger Clays—Kentucky
Ground Fire Clay—Ohio, Pennsylvania
Bitstone—all sizes
Fire Brick
Domestic Whiting

THE POTTERS SUPPLY COMPANY
EAST LIVERPOOL, OHIO

JOURNAL OF THE SOCIETY OF GLASS TECHNOLOGY

A bimonthly Journal containing the original papers communicated to the Society together with abstracts of other papers covering the whole field of glass technology.

Membership of the Society is open to all persons, or associations of persons, interested in glass.

Orders and enquiries should be addressed to—

The Secretary,
Society of Glass Technology,
The University,
"Elmfield," Northumberland Road,
SHEFFIELD 10, England.

ISCO SPECIALTIES
...for Ceramic Industry

GLASSMAKERS' BEESWAX— Refined Yellow
Also CARNAUBA WAX

CERAMIC TALCS — White Steatite Grades
Carlots direct from California Mines

Soft Decomposed CARRARA FLINT
Prime White • Uniformly Ground
80-99% through 325 mesh screen

For Temporary Binders

ISCO GUM GHATTI
GUM ARABIC • OURICURY WAX • CANDELILLA WAX

ISCO

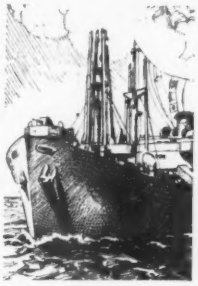
Our nearest office will be glad to give you further information

INNIS, SPEIDEN & CO.
117 LIBERTY STREET • NEW YORK 6, N. Y.
BOSTON • CHICAGO • CINCINNATI
CLEVELAND • GLOVERSVILLE • PHILADELPHIA

Granulators
Lancaster Iron Works, Inc.
Grinding Wheels
Carborundum Co. (*Carborundum and Aloxite*)
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)
Gums: *Arabic*—Amber Sorts, Powdered Grained
Ghatti—Powdered, Granular, Crude
Locust Bean—Powdered
Tragacanth—Ribbon—Flake—Powdered
Innis, Speiden & Co.
Hearths
Carborundum Co. (*Carbofrax* heat treating)
Corhart Refractories Co.
New Castle Refractories Co.
Norton Co. (*Crystolon*)
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.
Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.
Remmey, Richard C., Son Co.
High Temperature Mortars
Corhart Refractories Co.
Hoists, Portable Hand
Clipper Mfg. Co.
Hydraulic Propellers
Dennison Engineering Co.
Hydrofluoric Acid
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Ilmenite
Foote Mineral Co.
Orefraction, Inc.
Iron (Enameling)
American Rolling Mill Co.
Iron Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Vitro Mfg. Co.
Kaolin
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Vitro Mfg. Co.
Kiln Furniture (Silicon Carbide, Semi-Silicon Carbide) (Refractory)
Carborundum Co.
Electro Refractories & Alloys Corp.
Ferro Enamel Corp.—Ceramic Supply Div.
Maxson, Elwyn L.
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.
Kilns, China (Decorating)
Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.—Allied Engineering Div.
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.
Hommel, O., Co., Inc.
Swindell-Dressler Corp.
Kilns (Electric, Circular, Tunnel)
Ferro Enamel Corp.—Allied Engineering Div.
Harrop Ceramic Service Co.
Maxson, Elwyn L.
Swindell-Dressler Corp.
Kilns (Laboratory)
Remmey, Richard C., Son Co.
Kryolith (see Cryolite)
Pennsylvania Salt Mfg. Co.
Laboratory Ware
Norton Co.
Lehr Tile (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Electro Refractories & Alloys Corp.
New Castle Refractories Co.
Lehrs
Frazier-Simplex, Inc.
Swindell-Dressler Corp.
Lehrs (Electric or Fuel Heated)
Frazier-Simplex, Inc.
Swindell-Dressler Corp.
Lehr Loaders
Frazier-Simplex, Inc.
Linings (Furnace Refractory, Block Refractory Plate, Brick, and Tile)
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Maxson, Elwyn L.
Norton Co.
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.
Vitro Mfg. Co.
Lithium Carbonate
Drakenfeld, B. F., & Co., Inc.
Foote Mineral Co.
Hommel, O., Co., Inc.
Lithium Minerals
Foote Mineral Co.
Magnesia (Fused)
Electro Refractories & Alloys Corp.
Norton Co.
Magnesia (Sintered,Calcined)
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Magnesite
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Magnesite Calcined
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Magnesium Carbonate
Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel. O., Co., Inc.
Manganese Dioxide
Drakenfeld, B. F., & Co.
Ferro Enamel Corp.
Foote Mineral Co.
Hammill & Gillespie
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Manganese (Oxide)
Corhart Refractories Co.
Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Masks (Breathing)
Drakenfeld, B. F., & Co., Inc.
Hommel, O., Co., Inc.
Willson Products, Inc.
Metals (Porcelain Enameling)
American Rolling Mill Co.
Micronized Products
Pemco Corp.
Microscope, Laboratory
Bausch & Lomb Optical Co.
Microscopes (Polarizing)
Bausch & Lomb Optical Co.
Harshaw Chemical Co.
Spencer Lens Co.
Microscopes (Stereoscopic)
Bausch & Lomb Optical Co.
Harshaw Chemical Co.
Spencer Lens Co.
Minerals
Clinchfield Sand & Feldspar Corp.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Orefraction, Inc.
Vitro Mfg. Co.
Mixers
Clearfield Machine Co.
Mixers (Batch)
Clearfield Machine Co.
Lancaster Iron Works, Inc.
Mixers (Concrete, Paving, Road Paving, Plaster, Asphalt, Truck, Mortar, Bituminous)
Lancaster Iron Works, Inc.
Mixers (Laboratory)
Lancaster Iron Works, Inc.
Mold Sanders
Lancaster Iron Works, Inc.
Muffles (Furnace) (Laboratory)
Carborundum Co. (*Carbofrax*)
Electro Refractories & Alloys Corp.
Frazier-Simplex, Inc.
Maxson, Elwyn L.
Norton Co.
Remmey, Richard C., Son Co.
Mullers (Batch)
Clearfield Machine Co.
Lancaster Iron Works, Inc.
Mullite Refractories
Corhart Refractories Co.
Remmey, Richard C., Son Co.
Muriatic Acid
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Needle Antimony
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Nepheline Syenite
Great Lakes Foundry Sand Co.
Maxson, Elwyn L.
Nickel Salts
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Nitrates (Cobalt, Sodium)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Nitre
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Norbide (Norton Boron Carbide)
Norton Co.
Olivine
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Opacifiers
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Prod.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Maxson, Elwyn L.
Metal & Thermit Corp.
Pemco Corp.
Pennsylvania Salt Mfg. Co.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.
Overglaze Colors
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Oxides
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Prod.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Maxson, Elwyn L.
Metal & Thermit Corp.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.
Palladium Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.
Pans—Wet and Dry
Clearfield Machine Co.
Pins
Hommel, O., Co., Inc.
Industrial Ceramic Products, Inc.
Potters Supply Co.
Placing Sand
Great Lakes Foundry Sand Co.
Platinum Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.
Polariscopes
Frazier-Simplex, Inc.
Porcelain Enameling Service (Practical)
American Rolling Mill Co.
Chicago Vitreous Enamel Prod.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.
Porcelain Enamels
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.
Potash (Carbonate)
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co.,Inc.
Innis, Speiden & Co.
Solvay Sales Corp.
Vitro Mfg. Co.
Potassium Hydroxide
Innis, Speiden & Co.
Solvay Sales Corp.
Producer Gas Plants
Frazier-Simplex, Inc.

Vital bearings for a Mark XIV Gyro Compass being inspected with a Spencer Stereoscopic Microscope.

A Ship— A Compass— A Microscope—



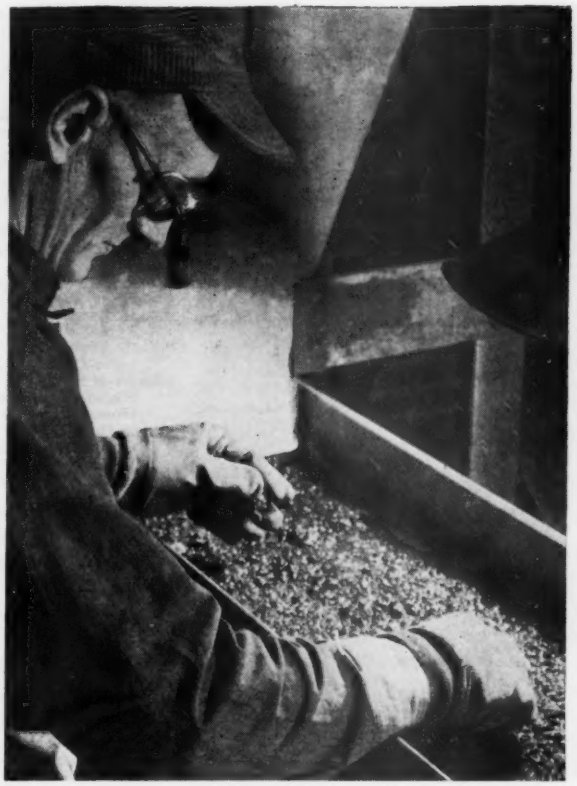
A bridge of American merchant ships is carrying tens of thousands of tons of fighting supplies to our allies and our own armed forces in every quarter of the globe.

Indispensable to navigation on many of these ships is the famous Sperry Mark XIV Gyro Compass. On hazardous voyages, blacked out and unable to use radio, ships are guided on their course by this precise instrument.

To inspect certain parts during manufacture, Sperry uses Spencer Stereoscopic microscopes. Their depth of focus, large object field and high resolution of fine detail enable inspectors to see greatly magnified images of parts with hair line sharpness and with stereoscopic, three-dimensional clarity.

ARMY E NAVY

Spencer LENS COMPANY
BUFFALO, NEW YORK
SCIENTIFIC INSTRUMENT DIVISION OF
AMERICAN OPTICAL COMPANY



RIGID INSPECTION

Every bag of Ing-Rich Porcelfrit is closely inspected before it is prepared for shipment. This rigid inspection insures that you will receive top performance in the Ing-Rich frit you use in your plant.

Why not specify Ing-Rich Plant-Tested Porcelfrit for your line of products now and after the war?

INGRAM-RICHARDSON
MFG. CO. OF IND., INC.
FRANKFORT, IND.

ING-RICH
PORCELFRIT
"The Plant Tested Frit"
INGRAM RICHARDSON MFG. CO. OF IND. INC.
FRANKFORT INDIANA

Pug Mills
Lancaster Iron Works, Inc.
Pyrites (Natural Iron Sulphide)
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Pyrometer Tubes
Carborundum Co.
Leeds & Northrup Co.
Maxson, Elwyn L.
Montgomery Porcelain Products Co.
Pyrometer Tubes (Refractory and Hard Porcelain)
Electro Refractories & Alloys Corp.
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co.
Norton Co.
Taylor, Charles, Sons Co.
Pyrometers (Optical, Radiation, Surface, Immersion, Needle)
Leeds & Northrup Co.

Pyrometric Cones
Du Pont, de Nemours, E. I., & Co., Inc.
Edward Orton, Jr., Ceramic Foundation
Maxson, Elwyn L.
Pyrophyllite
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Quartz (Granulated)
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc.
Ramming Mixes
Corhart Refractories Co.

Raw Material Handling Equipment
Frazier-Simplex, Inc.
Recorders, CO_2
Hays Corp.
Leeds & Northrup Co.
Recorders, Draft
Hays Corp.
Leeds & Northrup Co
Recorders, Tank Pressure
Hays Corp.
Leeds & Northrup Co.
Refractometers
Bausch & Lomb Optical Co.
Electro Refractories & Alloys Corp.
Spencer Lens Co.
Refractories
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
New Castle Refractories Co.
Norton Co.
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.
Refractory Aggregate Grain
Corhart Refractories Co.
Refractory Aggregate Grain for Catalytic Processes
Corhart Refractories Co.
Refractory Materials
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.
Titanium Alloy & Mfg. Co.
Respirators
Drakenfeld, B. F., & Co., Inc.
Hommel, O., Co., Inc.
Willson Products, Inc.
Rutile
Drakenfeld, B. F., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Titanium Alloy Mfg. Co.
Vitro Mfg. Co.
Willson Products, Inc.
Saggers
Carborundum Co.
Electro Refractories & Alloys Corp.
Ferro Enamel Corp.—Ceramic Supply Div.
Maxson, Elwyn L.
New Castle Refractories Co.
Norton Co.
Potters Supply Co.
Remmey, Richard C., Son Co.
Salt Cake
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co
Sandblast Sand
Great Lakes Foundry Sand Co.
Sand Grinders and Sifters
Lancaster Iron Works, Inc.
Saws (Masonry)
Clipper Mfg. Co.

Selenite of Sodium
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Selenium
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Sheets (Enameling Iron)
American Rolling Mill Co.
Silica (Fused)
Electro Refractories & Alloys Corp.
Foote Mineral Co.
Hommel, O., Co., Inc.
Remmey, Richard C., Son Co.
Silicate Furnace Refractories
Corhart Refractories Co.
Silicate of Soda
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Silicon Carbide
Carborundum Co.
Electro Refractories & Alloys Corp.
New Castle Refractories Co.
Norton Co.
Sillimanite Refractories
Electro Refractories & Alloys Corp.
Maxson, Elwyn L.
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.
Slabs (Furnace)
Carborundum Co.
Electro Refractories & Alloys Corp.
Maxson, Elwyn L.
New Castle Refractories Co.
Norton Co.
Remmey, Richard C., Son Co.
Soap, Mouldmakers
Drakenfeld, B. F., & Co., Inc.
Soda Ash
American Potash & Chemical Corp.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
Vitro Mfg. Co
Sodium Antimonate
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Vitro Mfg. Co.
Sodium Fluoride
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Sodium Metasilicate
Harshaw Chemical Co.
Innis, Speiden & Co.
Sodium Nitrite
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Sodium Orthosilicate
Innis, Speiden & Co.
Sodium Silica Fluoride
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Innis, Speiden & Co.
Sodium Uranate
Drakenfeld, B. F., & Co., Inc.
Du Pont, de Nemours, E. I., & Co., Inc. Electrochemical Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Soot Blowers
Frazier-Simplex, Inc.
Special Machines
Frazier-Simplex, Inc.
Spar
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Vitro Mfg. Co.
Spray Booths
Hommel, O., Co., Inc.
Spraying Equipment
Hommel, O., Co., Inc.
Spurs
Potters Supply Co.
Stacks
Lancaster Iron Works, Inc.
Steel Plate Construction
Lancaster Iron Works, Inc.
Stilts
Hommel, O., Co., Inc.
Industrial Ceramic Products, Inc.
Potters Supply Co.

Strontium Carbonate
Pennsylvania Salt Mfg. Co.
Sulfur
Hommel, O., Co., Inc.
Stauffer Chemical Co.
Sulfuric Acid
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
Talc (Lava)
Clinchfield Sand & Feldspar Corp.
Maxson, Elwyn L.
Talcs
Clinchfield Sand & Feldspar Corp.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Innis, Speiden & Co.
Tanks
Frazier-Simplex, Inc.
Tank Blocks
Corhart Refractories Co.
Tanks (Pickle)
Hommel, O., Co., Inc
Tanks for Raw Material Steel or Concrete
Lancaster Iron Works, Inc.
Thimbles—Decorating
Potters Supply Co.
Tile (Floor)
Carborundum Co.
Norton Co
Tile (Muffle)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.
Tile (Refractory)
Carborundum Co., (*Carbofrax*)
Electro Refractories & Alloys Corp.
New Castle Refractories Co.
Norton Co
Remmey, Richard C., Son Co.
Taylor, Charles, Sons Co.
Tin Oxide
Drakenfeld, B. F., & Co., Inc
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Vitro Mfg. Co
Titanium Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Titanium Alloy Mfg. Co.
Vitro Mfg. Co.
Trisodium Phosphate
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Trucks
Lancaster Iron Works, Inc.
Tubes (Insulating)
Carborundum Co.
McDanel Refractory Porcelain Co.
Norton Co.
Tubes (Pyrometer)
Carborundum Co.
Electro Refractories & Alloys Corp.
Leeds & Northrup Co.
Maxson, Elwyn L.
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co.
Norton Co.
Taylor, Charles, Sons Co.
Uranium Oxide
Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Uranium Oxide (Yellow-Orange-Black)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Uverite
Harshaw Chemical Co.
Water Softening Plants
Frazier-Simplex, Inc.
Waxes (Beeswax, Carnauba, Refined yellow Beeswax)
Innis, Speiden & Co.
Wet Enamel
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.
Wheels, Abrasive Cut-Off
Clipper Mfg. Co.
Whiting
Drakenfeld, B. F., & Co., Inc.

"Ceramic"

Colors - - Chemicals

for profitable operation

ENAMEL—Oxides and Colors; Smelter Oxides; Graining and Screening Colors.

POTTERY—Glaze and Body Stains; Underglaze and Overglaze Colors; Art Glazes; Frits.

GLASS—Vitrifiable Colors; Batch Colors; Alkali Resisting, Acid Resisting, Satin Matt Finish, High Fire Convexing, and Low Fire Colors; White or Colored Weather Resisting Enamels; Colored or Crystal Ices.

DECORATING SUPPLIES—Camel Hair Brushes; Fat Oil; Oil of Copaiba; Balsam of Copaiba; Balsam of Fir; Palette Knives and Spatulas; Paste Grinding Mills.

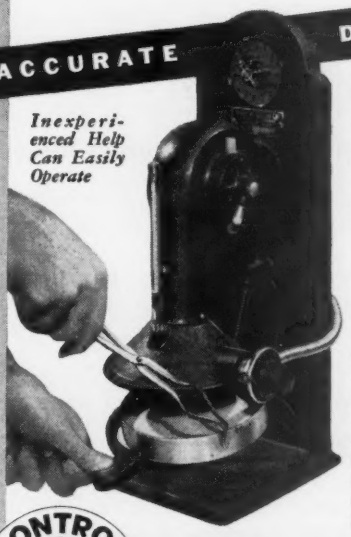
MILLROOM SUPPLIES—Porcelain Balls and Blocks; Flint Blocks and Grinding Cubes; Porcelain Jar Mills.

CHEMICALS—Aluminum Hydrate, Antimony Oxide, Antimony Sulphide, Barium Carbonate, Bentonite, Bone Ash, Cadmium Sulphide, Chromium Oxide, Cobalt Compounds, Clay—Enameler's, Copper Oxide, Cryolite—Synthetic, Iron Oxides, Manganese Dioxide, Molybdenum Compounds, Nickel Oxides, Powder Blue, Pyrophyllite, Rutile, Selenium, Sodium Antimonate, Sodium Silicate, Sodium Silico Fluoride, Whiting, Zinc Oxides, Zirconium Compounds.

CERAMIC COLOR & CHEMICAL MFG. CO... NEW BRIGHTON, PA.

Determine Moisture Content Within a FEW MINUTES

ACCURATE DEPENDABLE



Inexperienced Help Can Easily Operate

The Dietert Moisture Teller is being used in Ceramic plants and laboratories as a time and money saver. Moisture content is determined accurately and rapidly, by forcing electrically heated air through the test sample of clay, grog, frit, sand, dry enamel, graphite fire clay, dolomite and other granular materials. Test is in exact moisture percentage by gravimetric method and no corrections or calibrations are required. Write today.

CONTROL EQUIPMENT SAVES TIME

Harry W Dietert Co.

9330 OSELAWN DETROIT 4, MICH.

BUYERS' GUIDE

Du Pont de Nemours, E. I., & Co., Inc.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Potters Supply Co.
Vitro Mfg. Co.

Winding Drums
Lancaster Iron Works, Inc.

Zinc Oxide
Du Pont de Nemours, E. I., & Co., Inc
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Zircon
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
Hommel, O., Co., Inc.
Metal & Thermit Co.
Orefraction, Inc.
Titanium Alloy Mfg. Co.

Zirconia
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Zirconium Oxide
Foote Mineral Co.
Hommel, O., Co., Inc.
Orefraction, Inc.
Titanium Alloy Mfg. Co.

Zircon Refractories
Corhart Refractories Co.
Remmey, Richard C., Son Co.
Titanium Alloy Mfg. Co.

Zirconium Silicate
Foote Mineral Co.
Orefraction, Inc.
Titanium Alloy Mfg. Co.

Zirconium Silicate and Ultrox
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.

Zirkite (Natural ZrO_2)
Foote Mineral Co.
Hommel, O., Co., Inc.

WANTED TO BUY

Transactions of The American Ceramic Society
Volumes 2, 6, 8, 9, 10, 11, 12, 15, 17, 19

The American Ceramic Society, Inc.
2525 N. High St. **Columbus 2, Ohio**

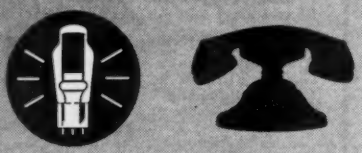
A MODERN SYLLOGISM

MAJOR PREMISE:

Bell Telephone System serves the American Public.

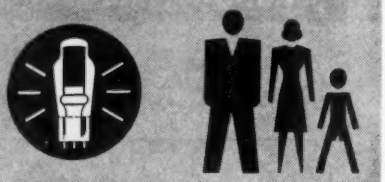
MINOR PREMISE:

Bell Telephone Laboratories develop the facilities of the Bell System.



CONCLUSION:

Therefore, Bell Laboratories serve the American Public.



And that is the *raison d'être* of the Laboratories. For the Bell Telephone System, the Laboratories carry on research studies in all the sciences and development work in all the engineering arts that relate to electrical communication.

For the Western Electric Company, the manufacturing unit of the System, the Laboratories develop equipment, prepare specifications, and engage in various engineering activities.

For the Armed Forces of the United States, under contracts of the Western Electric, the Laboratories have undertaken more than a thousand development projects — many with spectacular effect upon our enemies.

BELL TELEPHONE LABORATORIES ***explore and invent, devise and perfect for our Armed Forces at war and for continued improvements and economies in telephone service.***

SPINKS

High Grade—Uniform Quality Clays

Types to Suit Your Individual Needs

Ball

Sagger

Wad

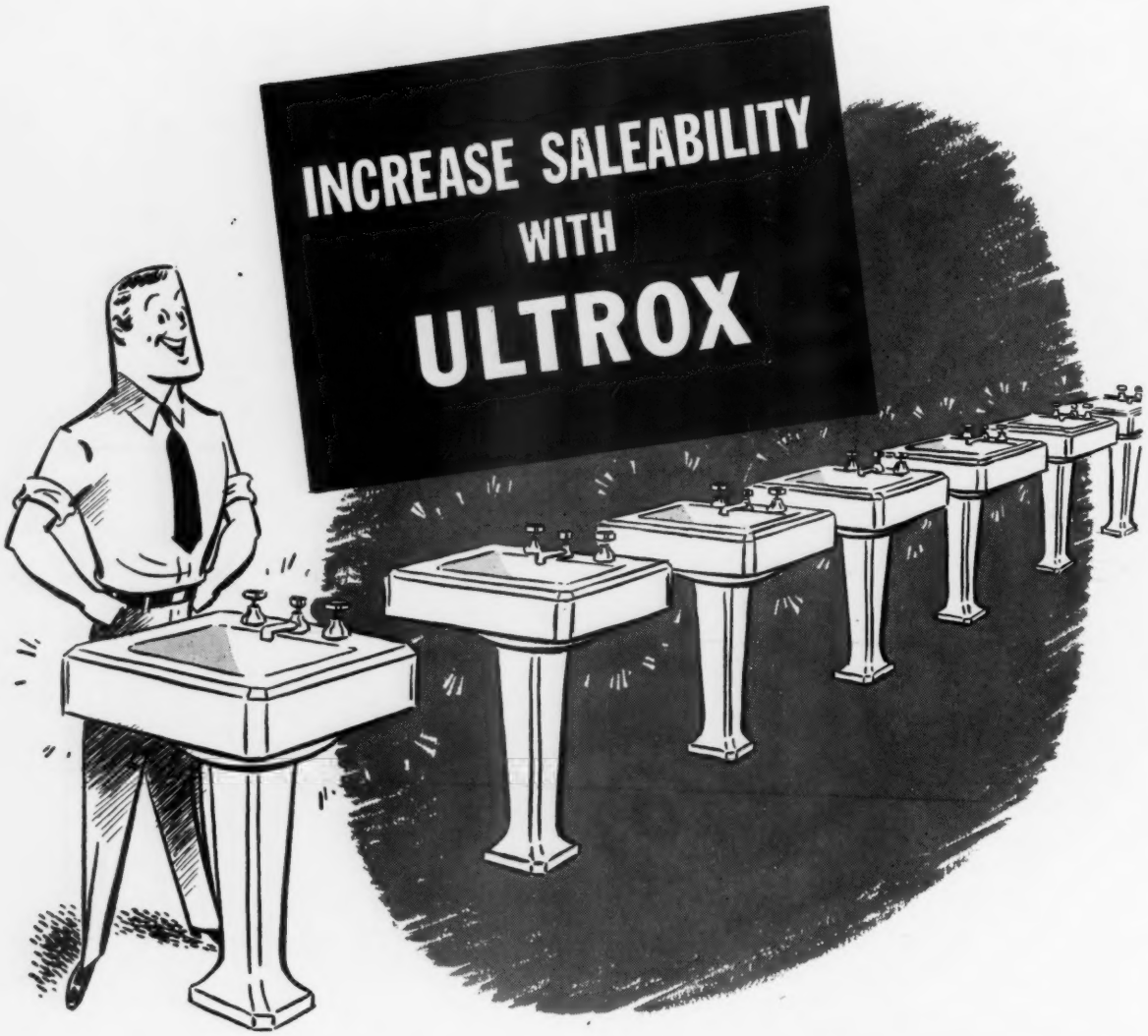
CLAYS

The Spinks organization offers you the highest grade clays—all mined and stored under the strictest supervision and with the most modern equipment. Ample storage facilities assure you prompt shipment and low moisture content.

Write Us for Samples

H. C. SPINKS CLAY CO.

P. O. BOX 256 - - NEWPORT, KY.



M & T's new, super-refined zirconium opacifer—ULTROX—produces whiter glazes with smoother surface texture that mean an increase in your product's saleability.

Follow the footsteps of many other leading manufacturers to M & T's Ceramic Laboratory, where you'll find the answers to your glaze or enamel problems—production hints that will pave the way for product improvement and lower costs.

PROMPT DELIVERY?
YES!
ULTROX
Sodium Antimonate
Antimony Oxide
Zircon
We ship from stock for immediate delivery.

METAL & THERMIT CORPORATION
120 Broadway, New York 5, N. Y.

CERAMIC DIVISION